FACTORS INFLUENCING IMPLEMENTATION OF E-LEARNING IN TECHNICAL AND VOCATIONAL EDUCATION TRAINING INSTITUTIONS IN UASIN GISHU COUNTY, KENYA

BY

SISIMWO FAITH MAIBA

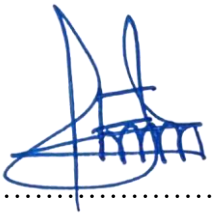
A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF MASTER OF EDUCATION IN TECHNOLOGY EDUCATION (ELECTRICAL AND ELECTRONICS TECHNOLOGY) DEPARTMENT OF TECHNOLOGY EDUCATION, UNIVERSITY OF ELDORET, KENYA

OCTOBER, 2023

DECLARATION

Declaration by the Student

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



……. **Date** _____

Sisimwo Maiba Faith

SEDU/TED/M/018/21

Declaration by the Supervisors

This thesis has been submitted for examination with our approval as University Supervisors

_____ **Date** _____

Dr. Hoseah Kiplagat

University of Eldoret, Kenya

_____ **Date** _____

Dr. Richard Ochieng'

University of Eldoret, Kenya

DEDICATION

I dedicate this work to my parents for their love, patience and financial support in the payment of my university fees. To my siblings Leland, Dennis, Naomi, and Caleb for their love and sacrifice they granted unto me during the period of my studies.

ABSTRACT

Globally, e-learning has emerged as a dominant channel of learning but its implementation is not smooth sailing. This is evidenced by unavoidable difficulties in implementing e-learning calling for investigation into the factors influencing the implementation of e-learning. In this regard, the study determined factors that influence implementation of e-learning in TVET institutions in Uasin Gishu County. The study was guided by the following specific objectives, to; assess the influence of institutional management support on implementation of e-learning; analyze the influence of infrastructure on implementation of e-learning; investigate the influence of ICT competence on implementation of e-learning and; influence of organizational learning culture on implementation of e-learning in TVET institutions in Uasin Gishu County. The study was guided by Roger's theory of Diffusion of innovation. The study adopted an explanatory research design with an accessible population of 94 electrical and electronic engineering trainers and 6 HoDs of electrical and electronic engineering departments from public TVET institutions from Uasin Gishu County who were engaged in the study through census inquiry. Data was collected by use of questionnaire and interview schedule. The instruments were tested for validity and reliability by checking the internal consistency after piloting questionnaire at Kitale National Polytechnic. Quantitative data was analyzed by use of both inferential and descriptive statistics using Statistical Package for Social Sciences (SPSS) version 25 while qualitative data using themes and sub-themes. The inferential statistics, which were used in this study included simple, multiple regression and Pearson's correlation, Analysis of Variance (ANOVA) while descriptive statistics included mean, standard deviation, and frequencies. From the findings, the coefficient of determination (R square) of 0.758 indicated that the model explained only 75.8 % of the variation or change in implementation of e-learning. ICT competency with a coefficient of determination R square of 0.623 indicated that the model explained 62.3% of the variation or change in implementation of e-learning, infrastructure with a coefficient of determination R square of 0.449 indicated that the model explained 44.9%, of the variation or change in implementation of e-learning, Organizational Learning Culture with a coefficient of determination R square of 0.42 indicated that the model explained 42% of the variation or change in implementation of e-learning and Institutional management support with a coefficient of determination R square of 0.418 indicated that the model explained 41.8% of the variation or change in implementation of e-learning. Based on the multiple regression coefficients ICT competence has the greatest contribution with B of v0.529 however this did not devalue the role of the other factors. Therefore, TVET institutions should consider strengthening institutional management support, infrastructure, ICT competency and organizational learning culture using a policy framework to enhance their synergy in implementation of e-learning in the teaching of electrical and electronic engineering.

TABLE OF CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS

ANOVA Analysis of Variance

ELS e-learning solutions

ELS Electronic Learning Systems

ICT Information and Communication Technology

IMS Institutional management Support

IS Information Systems

LMS Latent Moderated Structuring

LMS Learning Management Systems

ODeL Open Distance and e-Learning

OLC Organizational Learning Culture

SPSS Statistical package of Social Sciences

TVET Technical and Vocational Education and Training

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENT

First, I thank the All-powerful God for the great wellbeing and security he has conceded to me from the start and hopefully until the end of the research. I am grateful to everyone who has directly or indirectly contributed towards making this thesis a success. Am thankful to the supervisors who are more than willing to help in the development of the research. In addition, I would like to acknowledge my fellow colleagues and students who are always guiding and giving me consolation. To my parents and siblings, I am indebted to you for the finances you have given through the research process and to the daily consolation. You have given me the certainty to focus and invest more energy without which my efforts would not be a success. To every one of you referenced above, I wish you God's blessings.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter gives the background of the study, the description of the problem, the objectives of the study, the research question, and the justification of the study, scope of the study, theoretical framework, conceptual framework and operational definition of terms.

1.2 Background of the Study

The rise in digital technologies has steered the transformation and expansion of Technical and Vocational Education and Training institutions (TVET) worldwide (Latchem, 2017). This can be attributed to information communication and technology (ICT) that stimulates innovation and provides new opportunities for enhancing learning in education and training and making it more adaptable, accessible, and gratifying. Though there are advantages that accrue from adopting e-Learning, its implementation and provision has not been smooth sailing. It has had to contend with certain national, organizational, technical and social challenges that undermine its successful implementation (Kibuku, Ochieng & Wausi, 2020). Darby (2020) further argues that despite the effort and investment made, teachers and staff hardly use technology and e-learning systems in the envisioned way since they are often underutilized. These altogether have left the stakeholders dissatisfied with implementation of e-learning initiatives in higher learning institutions without exception to TVET institutions. It therefore calls for investigation of the factors that influence implementation of e-learning in TVET institutions.

According to Rajput (2019), e-learning is the expression broadly used to describe instructional content or learning experience delivered or enabled by electronic technologies. E-learning is also defined as the utilization of electronic technologies to access educational

curriculum outside of a traditional classroom (Turkyilmaz, Hariri & Jahangiri, 2019). E-Learning is the process of sharing knowledge through various channels such as e-books, CDs, webinars and more. It has revolutionized the conventional method of chalk and board style of learning imparted to the students. Additionally, using computers, mobile phones, computer networks, internet connections, and other less expensive methods of connection, e-learning technologies are used to send learning instructions to students who are located in remote places from a central site. E-learning is significantly used to offer quality education and enroll more students on respective courses (Reich et al., 2020). Thus, TVET institutions consider exploring the latest technology such as the internet and different web technologies to facilitate distance learning. Through e-learning, the transfer of skills and knowledge is done simultaneously and at different periods to the learners. According to Karmakar (2000) e-learning creates opportunities for organizations in the following ways: save time, cost, and effort; satisfy educational needs from remote areas; provide self-learning opportunities that have a positive impact on the learning process and provide a mechanism for collaborative learning. On the contrary, traditional modes of delivery are restrictive in accessibility of learning resources by the students.

This underscores the need for effective implementation of e-learning platforms to secure maximal dividends of TVET training through an online only or blended online learning experience. This is amplified by the fact that implementation of e-learning offers greater collaboration and global opportunities to the learners and teachers. E-learning facilitates lifetime and global learning by providing unprecedented access to knowledge and personal learning methods laced with cost-effectiveness, steadily provision of content, fast, and learners can attend classes from anywhere in this globe (Picciano, Seaman, Shea & Swan, 2012).

In addition, effective implementation of e-learning results in incorporating videos, audios, quizzes, and other forms of media expressions in learning (Deepika, Soundarya, Karthikeyan & Kalaiselvan, 2021). Implementing e-learning in electrical engineering education entails using ICT in classroom activities. ICT aids in demonstrating and carrying out laboratory experiments, managing and administering courses and classes. Presentations with sufficient material, network diagrams, process diagrams, circuit diagrams, and flowcharts are essential in classroom teaching (Petrina, 2006). In addition, simulation software and compilers are vital in reinforcing circuits or programs. The teacher can use animations and visualizations to demonstrate the operation of a component, a circuit, or a process. In the absence of visualizers, the teacher can also interface ICT equipment such as digital still cameras and video cameras to projectors (Banday, Ahmed & Jan, 2014). As a result, the videos captured helps in demonstrating experiments in laboratories that can cover the entire class at a go, saving time that would otherwise require repetition for each group of students in a particular class.

Recent innovations in e-learning allows education to be individualized (adaptive learning), it enhances learners' interactions with each other (collaborative learning), and it transforms the role of the teacher (Jorge, Michael, & Rosanne, 2006). In spite of these, the possible challenges instructors and learners face in an e-learning environment and its implementation must be considered in order to ensure learner success (Gul, 2015). For instance, e-learning is expensive to produce and requires skilled personnel to create content. According to Wanga, Ngumbuke and Oroma (2012) factors such as inequality in access, cost of acquisition of ICT equipment, low levels of skills in technology, pedagogy of e-learning affect implementation of e-learning. Dumbiri and Nwadiani (2020) points that funding, e-learning application skills by lecturers, regular power supply, internet in institutions, maintenance culture and collaboration work amongst students are key to implementation of e-learning.

According to Tarus, Gichoya and Muumbo (2015) developing one complete e-learning course requires a longer period of time as well as resources such as computers and reliable internet connectivity affecting e-learning implementation. In addition to successfully use technology in their classes, they need to possess a positive attitude to the use of technology, e-learning skills, relevant e-content, operational e-learning policies, affordable and adequate internet bandwidth, ICT and e-learning infrastructure are critical components necessary for successful implementation of e-learning. In this regard, to achieve the successful implementation of e-learning, the institutions have to invest financially and technologically in strategies that improve the quality of learning.

As the world adopts new technologies at a fast rate, e learning implementation is expanding at an unprecedented rate in all parts of the world (Ali, 2020). In the US, online enrollments have continued to grow at rates far in excess of the total higher education student population. In Korea, Malaysia, the United States, and Denmark, have recorded significant increases in e-learning (Haleman & Yamat, 2021). According to Rytkonen and Rasmussen, (2010) is one of Denmark's top e-learning universities with approximately 95% of the teachers use ICT to communicate with their students and to plan their teaching. The majority of TVET institutions in developing nations use traditional teaching and learning delivery techniques that need both the learner and the teacher to be physically present in the classroom (Obwoge & Kwamboka, 2016). The learner is merely a recipient of the information; the teacher is primarily the source. A dynamic educational and working environment requires a present deviation from the standard. The use of the Internet in teaching and learning is largely limited from TVET classes even where institutions are internet connected in Africa, an index of poor implementation.

Most academic institutions in Sub-Saharan Africa are experiencing financial difficulties, making it difficult to obtain needed ICT and other support. According to George et al., (2014). Only 33% of 147 e-learning practitioners from 34 African nations said they delivered e-learning in various modalities. However, South Africa has recorded significant increases in e-learning amidst the challenges of implementation. Dumbiri and Nwadiani (2020) notes that in Nigeria in spite of the relevance of e-learning in teaching and learning teachers are not utilizing it. Implementation of E-learning has as well-presented great challenges such us Inequality in Access, cost of acquisition of ICT equipment, low levels of skills in technology, pedagogy of e-learning in equal measures to institutions of higher learning in Uganda (Wanga, Ngumbuke, & Oroma, 2012). According to Nyaundi (2020) a report developed by stakeholders in the Technical and Vocational Training sector points out that TVET training focuses on hands-on learning and this is complicating online delivery Kenya.

E-learning is a versatile pedagogical approach that, if correctly designed, can accommodate all students at the TVET level. Unfortunately, according to a study by Cheruiyot (2021), e-learning is slowly expanding among Kenya's public universities and TVET institutes. According to the e-Learning Africa (2012) Report; in Kenya, the following challenges to e-Learning rank high in this order: limited bandwidth, lack of appropriate ICT training, lack of priority in ICT funding, ICT sustainability and pressures due to poverty. Nyerere, Gravenir and Mse (2012) revealed that most of the e-learners (90.8%) were dissatisfied with the delivery of e-Learning and 85.6% of the e-tutors indicated that they were demotivated in executing their e-Learning responsibilities. Hence, the ministry of education has to invest in ICT infrastructure, digital literacy, digital content, and trainer upskilling to establish the framework for e-learning. Several studies have linked e-learning to various challenges that may hinder the implementation of e-learning. Previous studies classified the challenges into either technological or organizational factors. Yet, the studies hardly centered on bundling

factors such as ICT competence, infrastructure, institutional management support and organizational learning culture and how they influence implementation of e-learning in TVET institutions providing a gap for the current study.

1.3 Statement of the Problem

Kenya can reorient itself towards sustainable development, using TVET as a vehicle for socio-economic and technological transformation (Njeru & Mugi, 2018). In this regard, enrolment in TVET has been expanding at an unprecedented rate calling for implementation of e-learning platforms that are efficient in delivering content to a wide range of students. Besides, the adoption and use of e-learning promotes collaborative, active and lifelong learning (Khan, Hasan, & Clement, 2012). In addition, implementation of ICT among TVET students is more effective in developing cognitive learning compared to occupational hands-on skills. Therefore, many educational institutions have adapted their situations to meet the work demands and changing trends in education by adopting e-learning (Obwoge & Kwamboka, 2016).

However, in some learning institutions, conventional teaching habits are preferred rather than implementing ICT in teaching. Besides, the hallmark of TVET focuses on practical skills and work-readiness – making online learning challenging, particularly for occupations where online learning is a weak substitute for hands-on experience (Munyi, Okinda & Wambua, 2021). Besides, the worth of online learning is not fully trusted making its validity and credibility relatively low. Extensive studies have been done on the shortcomings of e-learning in education and learners concurrently, but its implementation in TVET institutions remains indecisive. Correspondingly, researchers like Bolliger and Martin (2018) discovered that e-learning negatively impacted students' learning experiences. Therefore, this study was

designed to determine factors affecting implementation of e-learning in TVET institutions in Uasin Gishu County.

1.4 Purpose of the study

The purpose of the study was to determine factors that hinder effective implementation of e-learning in TVET institutions in Uasin Gishu County. The study also aimed at proposing various strategies and interventions that can be put in place to improve the process of e-learning.

1.5 Objectives of the Study

1.5.1 Main Objective

To assess the implication of using e-learning in TVET institutions in Uasin Gishu County.

1.5.2 Specific Objectives

The study was guided by the following specific objectives:

i. To assess the influence of institutional management support on implementation of e-learning in TVET institutions in Uasin Gishu County.

ii. To analyze the influence of infrastructure on implementation of e-learning in TVET institutions in Uasin Gishu County

iii. To investigate the influence of ICT competence on implementation of e-learning in TVET institutions in Uasin Gishu County.

iv. To assess the influence of organizational learning culture on implementation of e-learning in TVET institutions in Uasin Gishu County.

1.6 Research Questions

This study was guided by the following questions:

i. To what extent does institutional management support influence the implementation of e-learning in TVET institutions in Uasin Gishu County?

ii. What is the extent of influence of existing infrastructure on the implementation of e-learning in TVET institutions in Uasin Gishu County?

iii. How does the level of ICT competence influence implementation of e-learning in TVET institutions in Uasin Gishu County?

iv. To what extent does organizational learning culture influence the implementation of e-learning in TVET institutions in Uasin Gishu County?

1.7 Justification of the Study

TVET institutions exist with the main agenda of creating and dispersing knowledge to learners. With technological advancement, the institutions are transitioning from delivering content in the classroom set up to virtual learning. This is justified by the fact that Information Communication and Technology (ICT) stimulates innovation, which provides new opportunities for enhancing learning. However, e-learning is experiencing several challenges that hinder effective implementation. Besides, e-learning is a weak substitute for hands-on experience where practical skills are required.

1.8 Significance of the study

The findings of the study can be of significance to, government, policy makers, and other stakeholders in promoting e-learning in TVET institutions. In addition, future researchers would use the findings as a basis for future studies.

1.9 Scope of the Study

The scope of the study was to determine the factors influencing implementation of e-learning in TVET institutions in Uasin Gishu County. Individual factors, such as ICT competence, infrastructure, institutional management support and organizational learning culture were considered as independent variables while the dependent variable was implementation of e-learning. The study focused on electrical and electronics engineering trainers from TVET institutions in Uasin Gishu County. Focus on electrical and electronics engineering was justified by the fact that development of ICT-based distance education in such technical and vocational subjects has been limited to date. The study adopted an explanatory research design and carried out in the months of July 2022 to March 2023.

1.10 Assumptions of the study

The study was guided by the assumption that there is differentiation in levels of implementation of e-learning among TVET institutions, allowing the study to correlate the factors affecting implementation of e-learning and successful implementation of e-learning. It was also assumed that feedback from the respondents during data collection gave uniform results. The sample size was representative of the population in order to allow for generalizability of findings to the TVET institutions and the Kenyan context. The study assumed that by providing respondents with anonymity, confidentiality, and the freedom to withdraw from the study at any time with no repercussions, participants responded honestly to the questionnaire. A pilot study ensured the probity of responses to research questions, allowing the researcher to get to the heart of the research problem.

1.11 Limitations of the Study

There is also a high likelihood of extreme sluggishness in completing the circulated

questionnaires. In response, the researcher did not only administer the questionnaire but also explained the purpose of the study. In the case of busy schedules by the respondents, the researcher adopted a drop-and-pick. Further the study relied on information from the trainers and HoDs thus it was not possible to ascertain the level of truthfulness in their statements. hence it led to underestimation of the collected data and threatened the findings from the instrument.

The investigation was limited to the factors influencing implementation of e-learning in TVET institutions in Uasin Gishu County with a focus on electrical and electronic engineering. Individual factors, such as ICT competence, infrastructure, institutional management support and organizational learning culture were considered as independent variables. The study delimited this by recommending that future research consider other factors other than ICT competence, infrastructure, institutional management support and organizational learning culture and implementation of e-learning in other TVET courses.

1.12 Theoretical Framework

The study considered the relevant theories that the study variables was hinged on. The Rogers' Theory of Diffusion of Innovation theory was used to understand the relationship between factors affecting implementation of e-learning in teaching electrical and electronics engineering courses at TVET institutes. Diffusion of Innovation (DOI) Theory, developed by E.M. Rogers in 1962 (Miller, 2015 is a theory that seeks to explain how, why, and at what rate new ideas and technology spread. Rogers argues that diffusion is the process by which an innovation is communicated over time among the participants in a social system (García Avilés, 2020). Rogers' diffusion of innovations theory is the most appropriate for investigating the adoption of technology in educational environments (Celik, Sahin, & Aydin, 2014). According to diffusion of innovation theory, diffusion is a specific kind of

communication and includes these communication elements: an innovation, two individuals or other units of adoption, and a communication channel. Thus, effective communication embracing requisite communication elements can help to build and foster a safe learning environment where students can thrive, prosper and learn (DeWitt & Slade, 2014). Therefore, in educational process and instructional design, new technology should be employed in an effective way with a meaningful pedagogical role rather than just content's transmitter (Jwaifell & Gasaymeh, 2013). This implies that the adoption of technology by TVET institutions would be optimal and enhanced if it would positively impact teaching.

Widespread use of technology and constant dissemination of information have paved the way for e-learning. Given that e-learning is considered an innovation that has an impact on educational settings in particular, the Diffusion of Innovations Theory can be used as a framework to further investigate factors affecting e-learning implementation in teaching electrical engineering. Despite the opportunity's e-learning offer, it has been argued that the use of multimedia resources in the educational process is not at the desired level (Hwang & Tsai, 2011). Based on the Diffusion of Innovations Theory, it is presumed that focusing on the critical success factors then e-learning implementation would certainly enhance curriculum implementation in electrical engineering. Thus, the strategic integration of technology into instruction mode to enhance traditional teaching techniques for effective curriculum implementation remains necessary. Lee, Hsiao and Ho, (2014); Walaba, (2010); García Avilés, 2020) emphasizes multimedia enhanced content as a form of innovation that can help to improve students' understanding of instructional materials.

Therefore, diffusion of innovations theory was useful in analyzing the acceptance rate of the institutional set However, the evidence for this theory, including the adopter categories, did not originate in the education industry and it was not developed to explicitly apply to

adoption of new behaviors or education technology and curriculum implementation innovations. Besides, technology alone is not the remedy to a quality education system; rather technology is useful relative to its need in achieving a learning outcome (Kervin, Verenikina, Wrona, & Jones, 2010). Using multimedia teaching may face a number of pedagogical, educational, and technical obstacles that need to be overcome. The theory has been tested in the foreign context limiting the generalization of the findings in the Kenyan context. Thus, the need for exploring the factors affecting implementation of e-learning in teaching electrical and electronics engineering.

1.13 Conceptual framework

A conceptual framework is a written or visual representation of an expected relationship between variables (Van der Waldt, 2020). Figure 1.1 shows the relationship between the construct of independent variables and the dependent variable of the study. As shown in the figure, the four constructs of the factors affecting implementation of e-learning in teaching consist of institutional management support, infrastructure, ICT competence and organizational learning culture. On the other hand, a dependent variable is implementation of e-learning in this study with indicators such as learner engagement, learning experiences, creativity and innovation of learner and usage of e-platforms. Intervening variables of the study include Government policy and trainees' entry behavior.

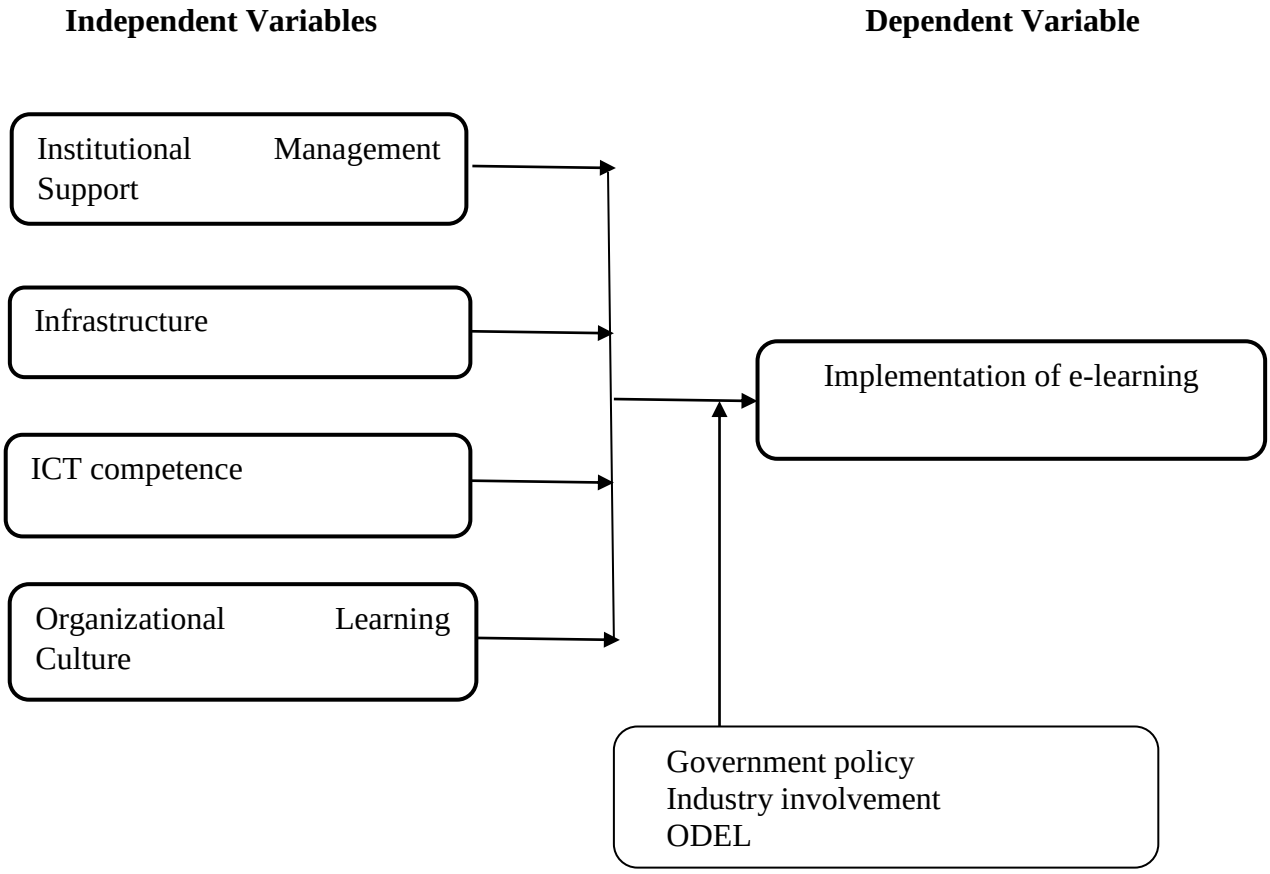


Figure 1.1 conceptual framework of the factors influencing the implementation of e-learning

1.14 Operational Definition of Terms

E-learning: a learning system based on formalized teaching but with the help of electronic resources

Government policy: set rules and principles that guide institutions in decision making resulting in a positive outcome that enhances learning.

ICT competence: knowledge, skills, and ability to take advantage of ICT for the purpose of gathering, processing and presenting information in support of e learning in TVET institutions

Industry involvement: organized economic activity concerned with manufacture, extraction and processing.

Infrastructure: Information and communication technology software, hardware, firmware, networks, and the company websites that are used in a TVET to support e-learning.

Institutional management support: the degree to which institutional management understands the importance of e-learning and are personally involved in e-learning activities for its success.

ODeL: variegated combination of teaching and learning methods.

Organizational learning culture: a set of norms and values about the functioning of an TVET institutions for employees learning and applying what have been learned to help the institution in strengthening e-learning

1.15 Summary of the Chapter

This chapter has given a description of the background of the study, an explanation of the problem, provided the objectives of the study in terms of factors that influence implementation of e-learning in TVET institutions in Uasin Gishu County and research questions. The chapter has also provided justification of the study, scope of the study in terms of variables, context, sample frame, research design and period. In addition, the chapter has explained the theoretical framework, conceptual framework and operational definition of terms.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provides insight into the research problem by reviewing previous literature. The chapter presents a review of variables, literature review on the objectives of the study and research gap.

2.2 Concept of E-learning

The process of learning using electronic technology and media is known as e-learning, sometimes known as online learning or electronic learning (Rodrigues, Almeida, Figueiredo & Lopes, 2019). E-teacher are e-learning instructional designers, facilitators of interaction, and subject matter experts. Because it can be as successful as conventional training while costing less, businesses and institutions use e-learning. E-learning is described as learning that is enabled electronically. E-learning is defined as the instructional content or learning experience delivered or enabled by electronic technologies whereas, M-learning is defined simply as learning via mobile devices such as cell phones, smart phones, palmtops, and handheld computers (Sri & Krishna, 2014). Developing e-learning is more expensive than producing classroom content and training teachers, especially if multimedia or highly interactive approaches are employed. However, the delivery costs for e-learning (including web server and technical support) are far cheaper than those for classroom facilities, instructor time, participant travel, and employment time missed to attend classroom sessions (Mardiah, 2020).

In most cases, they are the initial point of an online education program. Wikipedia defines LMS as a software application for the administration, documentation, tracking, reporting and delivery of educational courses and training programs. E-learning platforms: According to Guenaneche and Radigales (2008), e-learning platforms incorporate a variety of tools, such as

management tools, evaluation tools, monitoring tools, communication tools, and others. The software program offers academics and learners technical assistance to improve teaching and learning activities. The platforms can support traditional teaching and learning activities as well as a hybrid style of both conventional and e-learning activities. Wilkinson (2016) argued that using media resources as YouTube better enhances student's motivation and work. O'Neil, Wainess and Baker (2005) tend to reveal that the combined method of gaming impacts positively on the level of interaction and motivation. Wan, Wang and Haggerty (2008) notes that ICT refers to a broad spectrum of digital technologies that are used to produce, transmit, and distribute content. Offering services such as computer hardware, software, phone lines, and cellular Communications, email, wireless, cable, satellite, and cellular technologies Internet tools, multimedia, and communication networks. ICT tools help create a new industry. Ecosystems of information and education as a foundation for the growth and advancement of the school system. Mardiah (2020) asserts that there are unavoidable difficulties in implementing e-learning, such as the lack of WIFI or internet connectivity, learners' lack of motivation, and low levels of student engagement. Affective domains appeared to be minimized by the absence of genuine social and psychological interactions between professors and students in an e-learning environment. The teacher-student conversation is not as productive as it would be in a traditional classroom. The success of e-learning depends on government and institutional (college or university) support.

2.3 Factors Affecting Implementation of E-learning

One of the most critical criteria for successful e-Learning adoption is thorough evaluation of the underlying pedagogy, or how learning transpires online. In practice, however, this is often the most neglected aspect in any effort to implement e-Learning (Qu, Cong, & Hao, 2017). Wan, Wang and Haggerty (2008) in their study claimed that having experience with ICT and virtual competence were two important elements that affected e-learning and had a positive

influence on its results. Patel, Kadyamatimba and Madzvamuse (2017) points out that lack of training, poor awareness program and poor infrastructure are the contributing factors of the failure of the e-learning program. According to Owuor, Kogeda, Anele and Osuri (2013) bandwidth issue and connectivity, computer literacy and digital divide, lack of quality e-content, difficulty in engaging learners online, language barrier, access to hardware and network, interoperability and redundancy, e-learning within public education bodies, teachers and trainers' skills and access to hardware and network. The study focused on technology, trainers' ICT competence, resistance to change, and Institutional management support.

2.3.1 Institutional Management Support and Implementation of E-learning

Institutional management support is the degree to which institutional management recognizes the relevance of the information system (IS) function and is personally active in IS operations. The literature on information systems planning has constantly emphasized the necessity of Institutional Management support for the success of any organizational activity (Raghunathan & King, 1988). Institutional Management support **(**IMS) is described as top-level leaders' involvement and participation. Managers are specialists involved in conducting three-dimensional specialized managerial duties: interpersonal roles, informational roles, and decisional roles (Salmela, Eriksson & Fagerström, 2012). Decision-making roles are crucial for identifying institutional needs, allocating resources, resolving divisional tensions, and ensuring that e-learning solutions (ELS) is used strategically. Top management's complete support means more resources, improved communication across divisions, and superior decision-making. Because TMS affects superior decision-making, it has a favourable impact on system excellence and service. TMS increases system operation and dependability by committing financial and technological resources, resulting in higher system quality (Liu, Huang, & Lin, 2012). A good help desk service can help users feel less anxious, and a well-

designed ELS can give higher information quality, clear learning paths, and career guidance. TMS can also help users overcome their reluctance to ELS and ensure that it is effectively implemented. The full backing of senior management assures more resources, improved communication across departments, and superior decisionmaking (Elliott & Clayton, 2009). Liu, Huang, and Lin (2012) investigated the influence of organisational characteristics on the success of e-learning systems and organisational benefits in Taiwan.

Almaiah and Almulhem (2018) looked into the crucial elements that contribute to systems for online learning being successfully implemented. Delphi method was employed by the study to get a consensus among discussing the most important elements that make e-learning successful, according to expert responses. Implementation at universities in Saudi Arabia. Then, based on these findings, the study developed a framework that highlighted four domains that encompass website quality, technological choices, top concerns, and 11 important aspects. Faculty and students from academic institutions as well as their understanding of e-learning. However, the study did not focus on engineering trainers in the Kenyan TVET system.

Almaiah and Almulhem (2018) investigated the critical factors that lead to successful implementation of e-learning systems. The study used the Delphi technique to obtain consensus from expert respondents about the most critical factors that can contribute to successful e-learning implementation at Saudi Arabian universities. We then used these results to create a framework that highlights 11 critical factors grouped into four domains that cover website quality, technology options, institutional management support, and e-learning awareness by academic faculty and students. However, the study was not conducted in the Kenyan context amongst engineering trainers.

Tarus and Gichoya (2015) looked into and examined the prerequisites needed for e-learning to be successfully implemented in Kenyan universities. The study included university administration, e-learning support personnel, lecturers, and students who are currently using e-learning in a blended mode approach at three renowned Kenyan institutions, provided information through questionnaires and in-depth interviews. The results show that three categories of preconditions, technological, organizational, and pedagogical, were necessary for the successful implementation of e-learning.

Keramati, Afshari-Mofrad, and Kamrani (2011) develop a conceptual model to investigate the impact of preparedness variables in the interaction between E-Learning factors and E-Learning results. Readiness variables are classified into three categories: technological, organisational, and social. A questionnaire was completed by 96 people. This sample includes teachers from Tehran high schools who use technology-based education. When performed, hierarchical regression analysis and its results significantly support the appropriateness of the proposed model and demonstrate that the variable of readiness factors plays a moderating function in the link between E-Learning factors and outcomes. Furthermore, the latent moderated structure (LMS) technique and MPLUS3 software are used to determine the ranking of each variable. The study, however, was not done in the setting of TVET.

2.3.2 Infrastructure and Implementation of E-learning

The most essential factor influencing E-Learning performance is infrastructure. Technical and social infrastructure are of lesser relevance (Keramati, Afshari-Mofrad, Amir-Ashayeri, & Nili, 2011). Organisational characteristics, ICT infrastructures, ICT availability, and security are also significant concerns for assessing e-readiness. Some academics believe that infrastructure is an independent variable that has a direct impact on ELearning performance.

Sun, Tsai, Finger, Chen, and Yeh (2008), for instance, considered multiple infrastructures (such as the technology dimension and design dimension) as independent elements that directly affect e-learning success. MacGregor and Turner (2009) examined the effect of technological infrastructures on E-Learning outcomes. Furthermore, infrastructures are classified into three types based on earlier research and the authors' personal experiences: technical, organisational, and social. (2011) (Keramati, Afshari-Mofrad, Amir-Ashayeri, & Nili).

Keramati, Afshari-Mofrad, Amir-Ashayeri and Nili (2011) provided a conceptual framework to assess the significance of infrastructures in the performance and E-Learning factor relationships. A questionnaire was filled out by 96 survey participants. Tehran High School instructors made up this sample from schools that use a technology-based teaching approach. Hierarchical Regression analysis was done, and the results strongly supported the suggested model and showed that infrastructure has a moderating effect on the relationship between performance and the components of e-learning. Latent as well MPLUS3 software and the moderated structuring (LMS) approach are utilized to Rank each variable in order of importance. Findings indicate that the most significant factor influencing the effectiveness of e-learning is infrastructure and the teacher. However, the study was not conducted in the Kenyan context and amongst electrical engineering trainers in TVET.

Mwangi (2017) investigated ICT infrastructure preparedness for E-learning implementation in Kenyan universities. The study revealed that inadequate ICT infrastructure was a major challenge hindering the implementation of E-learning in Kenyan universities. The study recommended the need for enhancement of E-learning infrastructure to enable reliable access to the E-learning system by students and lecturers. Further, the findings can help universities in Kenya, the government and other stakeholders in coming up with strategies and

mechanisms that can enhance successful rollout for ICT infrastructure for e-learning implementation and provide a platform through which Kenya can transform into a knowledge economy hence boosting its productivity and competitiveness in the constantly changing global market. However, the study was conducted in the university setting.

Kiget, Wanyembi and Peters (2014) evaluated usability attributes that affect e-learning systems in Kenyan universities. The study had two-fold objectives; determining status of e-learning platforms and evaluating usability issues affecting e-learning adoption in Kenyan universities. The research took a case study of one of the public universities which has implemented Moodle e-learning system. The usability attributes evaluated were user-friendliness, learnability, technological infrastructure and policy. From the findings user-friendliness as a factor that affects usability of e-learning systems. Majority of the responses agreed that the e-learning system has to be user friendly for it to be usable. However, the study did not focus on TVET institutions and e-learning of electrical engineering.

Angeline (2012) determined the extent to which Information and Communication Technology (ICT) infrastructure influences readiness to adopt e-learning in secondary schools in Kitui district. The results established that institutional factors such as infrastructure (connectivity, sources of energy and e-equipment) have a significant influence on readiness to adopt e-learning. However, most schools in Kitui district did not have adequate infrastructure to support the adoption of e-learning. However, the study was conducted amongst secondary schools and not TVET institutions.

2.3.3 ICT Competence and Implementation of E-learning

Competency is the capacity to perform tasks successfully as a result of one's knowledge, abilities, traits, and attitudes (Kopaiboon, Reungtrakul, & Wongwanich, 2014). The three

components of competence are knowledge, skills, and attitudes. Knowledge refers to what a pupil has learned in a classroom or while working as an apprentice in a workshop. ICT competency is defined as the knowledge, abilities, and capacity to use ICT for information gathering, processing, and presentation in support of activities among various groups of people for professional reasons. (Amini & Oluyide, 2020). Teachers' competencies are the confidence, skill, and capability in using ICT for instruction purposes to perform the task appropriately (Jordan et al., 2019). Teachers' competency is a vital capacity required to implement ICT in teaching and learning. Inline, the absence of lack of proficiency with ICT-related tasks and ICT software tools and appliances is the root of the lack of confidence in using ICT in education.

As a condition for their efficiency in a computer-based learning environment, Amini and Oluyide (2020) assessed the ICT competencies of distance learning students at the National Open University of Nigeria (NOUN). Results indicated that National Open University of Nigeria distant learning students shown capabilities in the use of ICT to increase knowledge. But only a select few are capable of producing knowledge using technology and ICT. This is true even if many of the kids exhibit a high level of technological and computer proficiency. Additionally, the outcomes demonstrated that while students' gender is never a factor in their ICT ability, their certification is. However, the study was not conducted in the TVET context and amongst electrical engineering trainers.

Roszak and Kolodziejczak (2017) analyzed teachers' skills and ICT competencies necessary for teaching in a blended learning environment and for organizing the learning process that involves university e-courses. The areas of special importance included: learning materials, organization of learning groups, organization of knowledge evaluation, one-to-one communication, as well as communication with a learning group. The authors reviewed the

areas, pointing to certain essential components which are necessary for the teaching process with an LCMS. The study found that teachers' skills and ICT competencies are necessary for blended learning. However, the study did not focus on e-learning of electrical engineering. Besides, the study was not conducted in the context of Kenyan TVET institutions.

Bariu, Xiong and Azzeddine (2022) explored the implication of teachers' competencies on ICT implementation in universities. The empirical literature has established a considerable research gap despite teachers' competencies being critical in ICT implementation. The descriptive statistics results indicated a mean of 4.279 and a Spearman correlation of 0.618 between teachers' competencies and use of software tools, implying that teachers' level of competencies increases as they use and employ software tools when teaching. The chi-square test statistic indicated results of 288.498 and a significance of the value is less than the chosen significance level $\alpha = 0.05$, which checks for independence on the teachers' competencies on ICT implementation. Therefore, implying that the null hypothesis was rejected at the 5% level of testing. The conclusion was that there is significant evidence that teachers' competencies significantly influence ICT implementation. However, the study focused on ICT implementation and not e-learning implementation providing a gap for the current study.

This study by Murithi and Yoo (2021) looked at the accessibility of ICT resources, teachers' abilities to incorporate technology into their lessons, and teachers' attitudes towards technology in schools. The study's foundations included the Technology Acceptance Model and constructivist learning theory in particular. An online survey was completed by 351 instructors in total. Teachers believed that schools' ICT resources were insufficient, which made it difficult to incorporate technology into the rollout of the new curriculum. The majority of teachers responded that they had only had minimal training in computer literacy.

Despite feeling that computers should be used in the classroom, teachers have trouble incorporating technology into their lessons. However, the study was done in the context of TVET institutions and primary schools.

Salamatina (2020) did a theoretical analysis on the concept of professional competence of teachers, its structural content. Based on the spread of coronavirus infection and the transition of all educational institutions to distance learning, not all school and university teachers were ready to teach using information and communication technologies. Having conducted a thorough analysis of studying problems and identified the level of developing the ICT competence of a modern teacher. The basis of the research presented was the secondary schools of the Ural region. Based on the findings ICT competence should be necessarily formed and improved by teachers themselves continuously and purposefully, since the system of advanced training courses does not keep pace with the rapid development of the information environment. The study was conducted in a non-Kenyan context limiting the generalization of the findings.

2.3.4 Organizational Learning Culture (OLC) and Implementation of E-learning

Organizational culture is an important factor in successful e-learning (Hosseini, Salimifard & Yadollahi, 2017). OLC is a collection of organizational norms and values. Furthermore, it promotes methodical and in-depth techniques of creating knowledge or accomplishing higher-level strategy through phases of information gathering, information interpretation, and behavioral and cognitive changes in staff (Patnaik & Bhowmick, 2020). In the context of e-learning, OLC emphasizes the need to foster a culture of knowledge generation and sharing and mutual assistance, and the fulfillment of organizational goals. It is critical to adapt OLC to ELS solutions while designing and implementing them to eliminate potential conflict. To create an e-learning environment, OLC brings together content, technologists, specialists, and employees. OLC has a favorable direct impact on nonfinancial performance through

employee performance and a positive indirect impact on financial performance. Therefore, establishing an environment where people can and should continue learning and sharing their expertise is critical to an organization's competitive advantage.

The influence of ELS on organizational learning is moderated by OLC, implying that OLC collaborates with ELS to collect organizational knowledge. Excellent OLC helps employees overcome their differences and work toward institutional goals, reducing user resistance and improving communication. As a result, ELS planning and implementation may be managed, resulting in higher system quality. For the long-term viability of ELS, it is critical to adapt the functions and strategies per the business context. OLC enhances a company's ability to use and adapt e-learning to satisfy its needs. An organizational learning culture is positively related to system service (Lin, Huang & Zhang, 2019).

Hosseini, Salimifard, and Yadollahi (2017) assessed how organisational culture affects preparation for online learning. A sample of 68 questionnaires with questions on readiness and culture were examined. Using a Beta coefficient test, the research hypothesis was examined. According to research findings, clan and adhocracy cultures have a substantial favourable influence on preparation for e-learning. Additionally, it was discovered that market culture has a detrimental effect on e-learning readiness, and that there is no evidence to support a link between hierarchy culture and e-learning readiness. However, the study was not conducted in the Kenyan context. Noh, Isa, Samah, Noh, and Isa, (2012) focused on the various strategies and initiatives undertaken by UiTM and the e-Learning Centre (i-LeC) in establishing the e-learning culture in the university to motivate academicians to engage in e-learning. From the findings, different faculties and branches of the university are showing differing adoption rates and many regard non-traditional or non-classroom learning as less valuable and miss the face-to-face interaction with students. In addition, many older academicians are resistant to e-learning and need motivation to adopt the e-learning

technology in their teaching. Sonatha and Azmi, (2020) also noted the existence of organizational culture is estimated to have an influence on e-learning readiness.

Lin, Huang & Zhang (2019) examined the relationship between employee perceptions of an e-learning system, the existing OLC, and job satisfaction. The results suggest that employee acceptance of e-learning is a positive predictor of the OLC and employee job satisfaction. OLC mediates the relationship between the use and acceptance of e-learning by employees and their job satisfaction. However, the study was not conducted in the Kenyan context.

2.4 Gap in Literature

In some learning institutions conventional teaching habits are preferred rather than implementing ICT in teaching. Besides, the hallmark of TVET focuses on practical skills and work-readiness – making online learning challenging, particularly for occupations where online learning is a weak substitute for hands-on experience (Munyi, Okinda & Wambua, 2021). According to Nyaundi (2020) a report developed by stakeholders in the Technical and Vocational Training sector points out that TVET training focuses on hands-on learning and this is complicating online delivery in Kenya. Besides, extensive studies have been done on the shortcomings of e-learning in education and learners concurrently, its implementation in TVET institutions remains indecisive. Correspondingly, researchers like Bolliger and Martin (2018) discovered that e-learning negatively impacted students learning experiences.

Institutional management support influences superior decision-making, it positively relates to system excellence and service. IMS increases system operation and dependability by committing financial and technological resources, resulting in higher system quality (Liu, Huang, & Lin, 2012). However, the study did not focus on engineering trainers in the Kenyan TVET system. Tarus and Gichoya (2015) show that three categories of preconditions, technological, organizational, and pedagogical, were necessary for the

successful implementation of e-learning but the studies were not conducted in TVET providing a gap for the current study to find out the effect of institutional management support on the implementation of e-learning in TVET institutions in Uasin Gishu County.

The impact of technical infrastructures on the outcomes of e-Learning has been examined by Macgregor and Turner (2009), Mwangi (2017), and Kiget, Wanyembi, and Peters (2014). Infrastructure is divided into three categories, including technical, organisational, and social, based on prior research as well as the writers' own experiences (Keramati, Afshari-Mofrad, Amir-Ashayeri & Nili, 2011). Mwangi (2017) investigated on ICT infrastructure preparedness for E-learning implementation in Kenyan universities however, the studies were not e-learning on electrical engineering in TVET institutions providing a gap for the current study to find out the effect of infrastructure on implementation of e-learning in TVET institutions in Uasin Gishu County.

Teachers' competency is a vital capacity required to implement ICT in teaching and learning. Amini and Oluyide (2020), Roszak and Kolodziejczak (2017), Bariu, Xiong and Azzeddine (2022) evaluated the ICT competencies and e- learning implementation. However, the studies were conducted in a non - Kenyan context. Murithi and Yoo (2021) this study investigated the availability of ICT facilities; teacher capacity to integrate technology into their lessons; and teacher perceptions towards technology in schools. However, the study was limited in sample size and was not conducted focusing on implementation of e-learning in electrical engineering in TVET institutions. An organizational learning culture is positively related to system service (Lin, Huang & Zhang, 2019). However, there are limited studies in the Kenyan context focusing on implementation of e-learning in electrical engineering in TVET providing a gap for the study.

Wan, Wang and Haggerty (2008) in their study claimed that having experience with ICT and virtual competence were two important elements that affected e-learning and had a positive influence on its results. Patel, Kadyamatimba and Madzvamuse (2017) points out that lack of training, poor awareness program and poor infrastructure are the contributing factors of the failure of the e-learning program. According to Owuor, Kogeda, Anele and Osuri (2013) bandwidth issue and connectivity, computer literacy and digital divide, lack of quality e-content, difficulty in engaging learners online, language barrier, access to hardware and network, interoperability and redundancy, e-learning within public education bodies, teachers and trainers' skills and access to hardware and network. Previous studies classified the challenges into either technological or organizational factors. Yet, the studies hardly centered on bundling factors such as ICT competence, infrastructure, institutional management support and organizational learning culture and how they influence implementation of e-learning in TVET institutions providing a gap for the current study. Besides, the majority of the studies conducted on factors affecting implementation of e-learning were quantitative, providing a gap for the study, which can use both qualitative and quantitative data.

2.5 Summary of the Chapter

This chapter provides insight into the research problem by reviewing previous literature. The chapter presents a review of variables as concept of e-learning, Factors affecting implementation of e-learning, an empirical review on institutional management support, infrastructure, ICT competence, organizational learning culture and how they influence implementation of e-learning. Finally, the chapter explains the research gaps.

CHAPTER THREE

RESEARCH DESIGN METHODOLOGY

3.1 Introduction

This chapter gives details on the methodology, which was used to achieve the objectives of the study. A research methodology involves specific techniques that are adopted in the research process to collect, assemble and evaluate data. The chapter therefore discussed the techniques that were used in this study by describing the research design, area of study, the population of the study, sampling techniques, data collection techniques, methods of data analysis which was used and area of study.

3.2 Research Design

A Research Design is a methodical, well-organized procedure utilized by a researcher, or a scientist to carry out a scientific study (Elo et al., 2014). It is the overall synchronization of identified components and data resulting in a plausible outcome. The current study employed an explanatory research design. Explanatory research is actually a type of research design that focuses on explaining the aspects of the study (Wang, Stein, Gao & Ge, 2012). According to Cooper and Schindler (2014), explanatory research focuses on ‘why’ questions. In answering the `why' questions, the study developed explanations arguing that phenomenon Y (implementation of e-learning) is affected by variable X (factors) and even shows the extent of the effect. The explanatory research design was appropriate for this study because it seeks to explain the subject matter being researched and tries to answer the question of what, how, and why.

3.3 Area of Study

The study was conducted in Uasin Gishu County, which is one of the 47 counties of Kenya, located in the midwest of Kenya's former Rift Valley Province. It shares a common border with Trans Nzoia County to the North, Elgeyo Marakwet to the East, and Baringo County to the South East. Kericho County to the South, Nandi County to the South West and Kakamega County to the North West. It lies between longitudes $34^0$50' East and $35^0$37' West and Latitudes 0^0 03 South and 0^0 55' North (www.kenyacountyguide.co.ke, 2021). The county hosts both private and public and private TVET institutions. The study focused on public TVET institutions in Uasin Gishu because it is geared towards the implementation of e-learning which consist of National polytechnic and technical training institutions and thus the findings of the study can be generalized to other TVET institutions offering electrical and electronic engineering.

3.4 Target Population

A target population is the entire group of people or objects to which the researcher wishes to generalize the study findings (Polgar & Thomas, 2011). The target population, also known as the theoretical population, typically possesses a variety of traits. the intended audience was all trainers in electrical and electronic engineering in all public TVET institutions. The accessible population is the portion of the target population that the researcher can access (Nyante et al., 2019). Therefore, the accessible population was 94 trainers and 6 HoDs of electrical and electronic engineering from public TVET institutions in Uasin Gishu County.

Table.3.1 Target Population

Institution	Target Population
Eldoret National Polytechnic	29
Rift valley Technical Training Institute (RVTTI)	28
Kipkabus Technical	12
Koshin Technical	9
Ziwa Technical	9
Turbo Technical	7
Total	94

3.5 Sample Size

In this study, a census inquiry technique was adopted. Mugenda and Mugenda (2012) explain a census as an enumeration of all items in a population, which must be consistently defined for the purpose of study. The ideal sample is the one that fulfills the requirements of representativeness, efficiency, reliability, and flexibility in light of the entire population (Tamayo-Torres, Gutierrez-Gutierrez, & Ruiz-Moreno, 2014). Given that the total number of TVET Institutions in Uasin Gishu is small and in order to increase the level of accuracy, the study used census for the enumeration of all the electrical and electronic engineering trainers of the 6 TVET institutions. The trainers of electrical and electronic engineering were selected purposively. This was required as a result of the researcher's need to choose the specific participants who would be most likely to provide relevant and in-depth data. A total of 94 trainers of electrical and electronic engineering and 6 HoDs of electrical and electronic engineering department from 6 TVET institutions in Uasin Gishu County who had in-depth

knowledge of factors that influence the effective implementation of e-learning in teaching electrical engineering courses in Technical and Vocational Education Training Institutions.

3.6 Data Collection Instruments

Collis and Hussey (2014) noted that research instruments are measurement tools (for example, questionnaires or scales) designed to obtain data on a topic of interest from research subjects. Primary data was collected through questionnaires and interview schedules, while secondary data was obtained from published materials as reports and reviewing existing literature from other scholars. The main research instrument was a questionnaire and each item of the questionnaire addressed a specific objective and research question of the study.

A questionnaire is a research instrument consisting of a series of questions for gathering information from respondents (Singh, 2017). The study used closed ended questionnaires which were self-administered to the trainers of electrical engineering courses. The closed - ended questionnaire was designed using a 5-point Likert scale. Likert scale was used on the questionnaires to determine respondents' scores that are high and those that are low, for instance 5, representing strongly agree, 4 agree, 3 Undecided, 2 Disagree, to 1, Strongly Disagree (Vasudevan, 2016). Close-ended questions were used because they are easier to analyze since they are in a format that allows one to use. They are also easier to administer, because they have alternative answers.

According to Vasudevan (2016), an interview is a face-to-face communication that takes place between the researcher and the respondents. Hwang and Tsai (2011) designated an interview as a qualitative research method that is used to explore the views of a few respondents in a specific idea, program or situation. The authors contend that interviews can explore and brace participants' responses to collect in-depth data from their experiences and

feelings. Additionally, an interview schedule is described by Alexandra (2014) as a group of questions that an interviewer asks when collecting data. This research study applied semi-structured questions that strictly adhered to the use of an interview protocol to guide the researcher. The interview was administered by the researcher to HoDs of electrical and electronic engineering department from 6 TVET institutions in Uasin Gishu County who were expected to provide in-depth qualitative data on factors influencing implementation of e-learning in TVET institutions in Uasin Gishu County.

3.7 Piloting of the Research Instruments

Pilot testing is a necessary requirement for testing validity and reliability of research instruments using the test-retest method (Dikko, 2016). The pilot study was done with the aim of detecting possible flaws in measurement procedures and in the operationalization of independent variables, identifying unclear or ambiguous items in the questionnaire and to weed out/restructure unclear statements, determine time limits and clarify instructions. Besides, the pilot study aided in establishing practical problems of the research procedures and to reveal whether the proposed methods/instruments were inappropriate or complicated. Lucas and Brent (2012) reported that a pre-test sample should be between 1% and 10% depending on the sample size. The study sampled 9 respondents for the study which was approximately 10% of the sample size, of 94 respondents. The pilot testing was conducted at Kitale National Polytechnic.

3.7.1 Validity of Instruments

Validity is a degree to which an instrument measures what it is supposed to measure Heale and Twycross (2015) while Taherdoost (2016) defined it as the accuracy and meaningfulness of inferences or the degree to which data analysis results explain the study phenomenon. The

study conformed to an internal consistency reliability in order to evaluate the correlation between various items in the instruments. The study determined three main types of validity of the instruments, that is, face, content and construct validity. The researcher determined the face validity of the instruments by ensuring that questionnaires are prepared in line with the conceptual framework in Figure 1.1 to capture all the study variables. This ensured that the items in the instruments are meaningful and appropriate for the respondents. Content validity measures the magnitude to which the data collection instrument yields reasonably expected statistical outcomes of the study (Collis & Hussey, 2014). The researcher reviewed the literature in order to identify the items that require measuring the constructs, for example, factors that affect effective implementation of e-learning in teaching electrical and electronics engineering courses. Besides, the researcher consulted the supervisor for expert advice on the content validity of the study instruments. Their views and advice were used to improve the relevance, clarity, and wording of the items or questions in the study instrument. Construct validity attempts to establish the extent to which the research instrument could be interpreted as a meaningful measure of some characteristic or quality. Construct validity is an assessment of how well the theories or ideas have been translated into actual measures. The researcher established the construct validity of the instruments by reviewing theoretical and empirical literature.

3.7.2 Reliability of Instruments

Wise (2015) defined reliability as the degree to which a given test is capable of consistently yielding the same results or scores each time the test is administered to the same individuals. For research to be internally coherent, estimates of reliability are based on the mean inter-correlations among all the single items within a study (Collis & Hussey, 2014). After piloting, the Cronbach's Alpha of the items or questions in the questionnaires were computed

by the aid of Statistical Packages for Social Sciences software (SPSS) version 25. Cronbach's Alpha was used to establish the reliability coefficient for a set of research variables by determining how items in the questionnaires correlate among themselves. The threshold for Cronbach's Alpha coefficient 0.7 or above indicates a high level of internal consistency in the study questionnaire (Taber, 2018).

3.8. Data Collection Procedures

Data Collection Procedure shows the outline to be followed when administering the research instrument, which in this case are questionnaire. Before data collection, the researcher sought permission from the National Commission for Science, Technology and Innovation (NACOSTI) through the Department of Education, University of Eldoret as required by law on research undertaken in Kenya. The respective TVET institutions were notified of the intention and purpose of the study. The researcher administered the questionnaire to the respondents for easier clarification and consistency of information obtained. The questionnaires were introduced to the respondents by explaining the researcher's purpose for the survey.

3.9 Data Processing and Analysis

Once an adequate number of questionnaires is collected, each questionnaire was assigned a unique identification to avoid double entry and to facilitate coding of variables. All the data collected were coded and entered into an SPSS sheet, organized and cleaned for any inconsistencies. Data was then analyzed using statistical analysis, which entailed organizing data for description and decision-making. The strength of descriptive statistics is its power to gather, organize and compare immense amounts of discrete categorical and uninterrupted non-discreet (numerically unlimited) data in a more manageable form.

Descriptive statistics enabled the researcher to present the data in a more meaningful way, which allows simpler interpretation of the data (Collis & Hussey, 2014). To answer the research objectives several descriptive statistical techniques were used. These included frequency distributions, mean and standard deviation. A high mean score, higher than the benchmark of 3.5 implies that there is a higher level of agreement among the respondents concerning various research statements. Mean score of 3.0 implied that there is moderate level of agreement among the respondents. Besides, a mean score below 3.0 reveals the existence of disagreement among the respondents (Alexandra, 2014).

The aim of inferential statistics was to approximate and make inferences about statistical characteristics of populations. Inferential statistics are techniques that allow the use of samples to generalize the populations from which the samples were drawn. Analysis of Variance (ANOVA) was used to test the significant amount of variance in the dependent variable. ANOVA tells if there are any statistical differences between the means of three or more independent groups (Kim, 2017). The study used correlation and regression analysis in inferential statistics. Results from correlation and regression analysis were presented by use of tables. As a prerequisite of conducting multiple regressions, the researcher tested for normality, multicollinearity, auto-correlation and homoscedasticity.

The simple and multiple linear regression models was as follows:

$$y = \beta_0 + \beta_1 X_1 + \varepsilon \quad \text{Equation 3.1}$$

$$Y = \beta 0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon \quad \text{Equation 3.2}$$

Where Y is an implementation of e-learning, dependent variable X represents factors, β_{1-} β_4 are the unstandardized regression coefficients.

β_0 Represents the y intercept

Y Represents implementation of e-learning

X_1 Represents institutional management support

X_2 Represents infrastructure

X_3 Represents ICT competence

X_4 Represents Organizational learning culture

ε Represents error term

Table 3.2: Details of Data Analysis Per Objective

Hypothesis	Test Statistic
To assess the influence of institutional management support on implementation of e-learning in TVET institutions in Uasin Gishu County.	Descriptive statistics, Simple linear regression model of the form $y=\beta_{01}+\beta_1X_1+\varepsilon$, *Pearson* product-moment *correlation* coefficient (r),ANOVA
To analyze the influence of infrastructure on implementation of e-learning in TVET institutions in Uasin Gishu County	Descriptive statistics, Simple linear regression model of the form of $y=\beta_{01}+\beta_2X_2+\varepsilon$, *Pearson* product-moment *correlation* coefficient (r) ANOVA
To investigate the influence of ICT competence on implementation of e-learning in TVET institutions in Uasin Gishu County.	Descriptive statistics, Simple linear regression model of the form of $y=\beta_{01}+\beta_3X_3+\varepsilon$, *Pearson* product-moment *correlation* coefficient (r) ANOVA
To assess the influence of organizational learning culture on implementation of e-learning in TVET institutions in Uasin Gishu County	Descriptive statistics, Simple linear regression model of the form $y=\beta_{01}+\beta_4X_4+\varepsilon$, *Pearson* product-moment *correlation* coefficient (r), ANOVA

To determine factors that influence implementation of e-learning in TVET institutions in Uasin Gishu County.	multiple linear regression model of the form $\mathbf{Y = \beta 0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon}$, *Pearson* product-moment *correlation* coefficient (r),ANOVA

3.10 Ethical Considerations

Informed consent was the main concern, which the researcher sought from the participants. Participants were informed through the introduction letter that their participation is voluntary. Participants were assured of confidentiality such that whatever they contributed would not be linked to them since they remained anonymous. The researcher considered all possible consequences of the research and balanced the risks with proportionate benefit.

3.11 Summary of the Chapter

This chapter has described the methodology which was used to achieve the objectives of the study. The specific techniques that are adopted in the research process to collect, assemble and evaluate data. The chapter has therefore discussed different techniques such as the research design, area of study, the population of the study, sampling techniques and sample size calculation, data collection techniques for qualitative and quantitative data, methods of data analysis which were used, and finally ethical considerations for the study.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, INTERPRETATION AND DISCUSSION

4.1 Introduction

The chapter begins by giving the response rate to establish if the collected data was adequate to be analyzed and to be relied on, followed by the findings of the pilot study results analysis to determine reliability of the instrument used in data collection. For the main survey, descriptive results were analyzed in frequencies, percentages and means. These were then organised into tables. The results of inferential statistics, such as regression and coefficients of correlation, which were used to test for association and degree of variation in association, were tabulated, while qualitative data were analysed using content analysis.

4.2. Response Rate

A total of 94 structured questionnaires were distributed physically to the trainers of electrical and electronic engineering courses in 6 TVET institutions in Uasin Gishu County. Out of the 94 questionnaires, 87 questionnaires were filled and returned. This represented a 92.6 percent response rate. This response rate is considered satisfactory to make conclusions for the study. Any response rate of above 50 percent according to Benaquisto and Babbie (2002) is adequate for analysis while 60 percent and above 70 is good and very good respectively. Response rate of 92.6 percent is therefore very good. This response rate was achieved through making personal calls and visits to remind the respondents to fill-in and return the questionnaires.

Table 4.1: Response Rate

	Trainers of electrical and electronic engineering	
Sample size	**Number**	**Percentage**
Usable responses	87	92.6
Unusable responses	7	7.4
Total sample size responses	94	100

4.3 Reliability Test Results

Pilot testing was done in Kitale National Polytechnic where 9 respondents were given questionnaires but 7 were returned to the researcher from the trainers. Cronbach's alpha was applied in the determination of the level of internal consistency of the questionnaire items. The coefficient of reliability of the questionnaire was tabulated in Table: 4.2.

Table 4.2: Reliability of instrument

Construct	**Reliability coefficient**	**No of items**
Institutional management Support	0.705	6
Infrastructure	0.723	8
ICT competence	0.720	6
Organizational Learning	0.831	5
Implementation of e-learning	0.725	6
Overall Reliability	0.741	31

All the items in the questionnaires had an alpha value that was higher than the minimum acceptable value of alpha of at least 0.70 or above (Taber, 2018). The overall reliability coefficient was 0.741. This implies the proportion of the variance due to true score, versus error 74.1% = 0. 741. Therefore, the response items were considered reliable. In this regard the result confirmed the data was adequate and yields the same number or score each time it is administered, all other things being equal (Viladrich, Angulo-Brunet, & Doval, 2017).

4.4. Demographic Characteristics

Demographic information gives data on research participants and is required to determine whether the people in a study are a representative sample of the target population for generalisation purposes (Benaquisto & Babbie, 2002). Respondents were requested to submit

demographic information such as age, gender, employment experience, and highest level of education.

4.4.1 Gender of Respondent

Results on the gender of the trainers were analyzed and presented in table 4.3.

Table 4.3 Gender of Respondent

		Frequency	**Percentage**
Gender	Male	58	67.0
	Female	29	33.0
	Total	**87**	**100**

The majority of electronic and electrical engineering trainers were male, with a proportion of 67.0 percent, while females constituted 33.0 percent, indicating that, despite the majority of respondents are male, females constitute more than one-third of the sample population. This implies that the organization adheres to the principle of gender equality in employment, and so TVET institutions' actions regarding the implementation of e-learning are obligated to be gender sensitive (Kaimenyi, 2013). The chi-square for independence was computed and the results presented in Table 4.4.

Table 4.4: Chi-Square Test for the Association between Genders on implementation of e-learning in TVET institutions in Uasin Gishu County

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1479.000[a]	289	.000
Likelihood Ratio	457.787	289	.000
Linear-by-Linear Association	86.000	1	.000
N of Valid Cases	87		

a. 324 cells (100.0%) have expected count less than 5. The minimum expected count is .01.

As shown in Table 4.4, The association between gender and e-learning adoption in TVET institutions in Uasin Gishu County is statistically significant because the P value is smaller than.05, X2 (289, N=87) =1479.000a. This implies that the gender of the trainers influences the implementation of e-learning in TVET institutions in Uasin Gishu County. This is consistent with the concept that gender is a key factor in explaining disparities and identities in modern society (Murray, 1990).

4.4.2 Age of Respondent

Results on the age of the trainers were analyzed and presented in Table 4.5.

Table 4.5 Age of Respondents

		Frequency	**Percentage**
Age	20-30 years	16	18.4
	31- 40 years	47	54.0
	41-50 years	17	19.5
	51-60 years	7	8.0
	Total	**87**	**100**

Table 4.5 indicates that 18.4 percent of respondents (trainers) were between the ages of 20 and 30, 54.0 percent were between the ages of 31 and 40, 19.5 percent were between the ages of 41 and 50, and 8.0 percent were between the ages of 51 and 60. This demonstrated that the majority of trainers (72.4%) are under the age of 45, which is a youthful age full of energy, and so TVET institutions do not have the issue of ageing employees (Khurramovich, 2023). Adapting to new working conditions may be difficult for older employees since technology anxiety increases with age and they typically have less confidence in their own computer competence than younger coworkers (Hardy & Castonguay, 2018). The chi-square for independence was computed and results presented in Table 4.6.

Table 4.6: Chi-Square Test for the Association between Age Bracket on implementation of e-learning in TVET institutions in Uasin Gishu County

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	71.280[a]	51	.032
Likelihood Ratio	70.912	51	.034
Linear-by-Linear Association	7.428	1	.006
N of Valid Cases	87		

a. 70 cells (97.2%) have expected count less than 5. The minimum expected count is .08

As shown in Table 4.6, the association between age bracket and implementation of e-learning in TVET institutions in Uasin Gishu County is statistically significant since the P value is less than (.05), X^2 (51, N=87) =34.554[a]. This shows that the age of the trainers was related to the implementation of e-learning in TVET institutions in Uasin Gishu County. Zyad (2016) and Kuskaya and Kocak (2010) discovered that the younger the teachers, the more they used ICT.

4.4.3 Work Experience of Respondent

Results on the work experience of the trainers were analyzed and presented in Table 4.7

Table 4.7 Work Experience

		Frequency	Percentage
Work Experience	Less than 1 year	8	9.2
	1-5 years	9	10.3
	6-10 years	12	13.8
	11-15 years	8	9.2
	16-20 years	26	29.9
	Over 20 years	24	27.6
	Total	87	100.0

The distribution of work experience, as given in table 4.7 below, revealed that 9.2 percent had less than a year of experience. 10.3 percent had 1 to 5 years of experience, 13.8 percent had 6 to 10 years of working experience, 9.2 percent had 11 to 15 years of work experience, 29.9 percent had 16-20 years, and 27.6 percent had more than 20 years of work experience. The majority of employees have more than 5 years of work experience, as evidenced by an 80.5 percent share. This implies that the respondents had sufficient job experience as well as understanding of electrical and electronic engineering training and were able to provide credible information on which the study could rely. This is based on the 5-year minimum work experience necessary for TVET training (www.tveta.go.ke, 2019). Table 4.8 shows the results of the chi-square test for independence.

Table 4.8: Chi-Square Test for the Association between Work Experience on implementation of e-learning in TVET institutions in Uasin Gishu County

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	111.187[a]	85	.030
Likelihood Ratio	100.455	85	.121
Linear-by-Linear Association	2.891	1	.089
N of Valid Cases	87		

a. 108 cells (100.0%) have expected count less than 5. The minimum expected count is .09.

As shown in Table 4.8, the association between work experience and implementation of e-learning in TVET institutions in Uasin Gishu County is statistically significant since the P value is less than (.05), X^2 (85, N=87) =111.187[a]. This implies that the implementation of e-learning in TVET institutions in Uasin Gishu County was significantly associated with work experience of the trainers. Thus the, ability to implement ICT is dependent on the trainer's prior experience in the technology's use and the level of the acquired skills. This is supported by Mutisya and Makokha (2016) who noted that lecturers who lacked experience and confidence to utilize technology, would either not use it at all or use it ineffectively, thus compromising the successful implementation of e-learning.

4.4.4 Qualification of Respondent

Results on the qualifications of the trainers were analyzed and presented in table 4.9.

Table 4.9 Qualifications

		Frequency	Percentage
Level of education	Diploma	18	20.7
	Bachelor's Degree	45	51.7
	Postgraduate	7	8.0
	Any Other	17	19.5
	Total	**87**	**100**

It was also found out that majority of trainers (51.7 percent) had bachelor's degree, with 20.7 percent holding diplomas, 8.0 percent with Postgraduate qualifications while 19.5 percent processed other qualifications such as Craft and certificate of an approved Trainer of Trainers (ToTs) for Technical Instructors. This outcome implies that majority of trainers in Electrical and Electronic engineering had diploma level (80.5%) of training and above, which implies that TVET institution have employed trainers with above the minimum requisite level of education which is at least a craft level (www.tevta.go.ke., 2019). To discharge their role in effective implementation of e learning. The chi-square for independence was computed and results presented in Table 4.10.

Table 4.10: Chi-Square Test for the Association between Level of Education on implementation of e-learning in TVET institutions in Uasin Gishu County

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	83.673[a]	51	.003
Likelihood Ratio	77.028	51	.011
Linear-by-Linear Association	.097	1	.755
N of Valid Cases	87		

a. 70 cells (97.2%) have expected count less than 5. The minimum expected count is .08.

Source: Research study 2023

As shown in Table 4.10, the association between level of education and implementation of e-learning in TVET institutions in Uasin Gishu County is not statistically significant since the P value is less than (.05), X^2 (51, N=87) =83.673[a]. This implies that the implementation of e-learning in TVET institutions in Uasin Gishu County was significantly associated with the level of education of the trainers. Dial, (2008) notes that level of education of trainers influenced student achievement.

4.5 Descriptive Results for Variables

The descriptive results for factors that influence implementation of e-learning in TVET institutions in Uasin Gishu County variables were analyzed. A Likert scale of five points was applied with anchors which range from a very low score to very high score between 1 and 5. Consequently the average of the summed scores also ranged from 1 to 5. In order to fulfill the equidistance assumption in the Likert scale the minimum and the maximum length of the 5-point Likert type scale, the range was calculated by (5 − 1 = 4) then divided by five as it is the greatest value of the scale (4 ÷ 5 = 0.80) which resulted in an equidistance of 0.8 (Verma & Abdel-Salam, (2019); Orchard, King, Khalili, & Bezzina, 2012). The equidistance of 0.8 was distributed across the Likert resulting into the following intervals 1.0<1.8= strongly disagree (SD), 1.8<2.6 = Disagree (D), 2.6< 3.4= Undecided (UD), 3.4<4.2= Agree (A) and 4.2 to 5.0= Strongly Agree (SA). The mean was used for interpreting the results of individual items.

4.5.1 Descriptive Statistics of Institutional Management Support

Six questionnaire items were used to examine the prevailing status of institutional management support in implementation of e-learning in TVET institutions in Uasin Gishu County.

Table 4.11: Results of Descriptive Analysis of Institutional Management Support

Statements	SD	D	UD	A	SA	Mean	Std. Deviation
The financial allocation for implementation of e-learning is sufficient	5.7	41.7	5.7	26.4	20.7	3.15	1.317
E- learning Budgets are approved on time	9.2	26.4	0.0	49.4	14.9	3.34	1.274
Relevant and operational e-learning policies are fully supported management	1.1	18.4	6.9	41.4	32.2	3.85	1.105
There is a timely address of management-oriented challenges	1.1	23.0	11.5	57.5	6.9	3.46	.962
The trainers are adequately motivated to take part in e-learning	8.0	12.6	14.9	21.8	42.5	3.78	1.333
A facilitating environment for e-learning is provided by the management	2.3	18.4	9.2	46.0	24.1	3.71	1.099
AVERAGE MEAN						**3.55**	**0.744**

Results presented in Table 4.11 reveal that most respondents at 47.1 percent were in agreement that there is adequate financial allocation for e-learning activities while 5.7% were undecided, 41.1% disagreed while 5.7% strongly disagreed (Mean=3.15 SD=1.008). The respondents were also in agreement at 64.3% that budgets for e- learning activities are

approved on time while 35.6% of respondents were in disagreement (Mean=3.34 SD=1.274). E-learning cannot take effect without effective budgetary allocation for both the students and the trainers. This is in line with Allen (2016) the argument of that without effective budgetary approval there is no e-learning. Trainers were in agreement at 73.6% that the management fully supported relevant and operational e-learning policies while 19.5% were in disagreement and 6.9% undecided (Mean=3.85; SD=1.105). It can therefore be understood that the relevance of institutional management support remains key in ensuring e-learning takes prominence in electrical and electronics engineering training. In terms of the management-oriented challenges being addressed on time 6.9% of respondents strongly agreed, 57.5% of respondents agreed, 11.5% were undecided while 34.1% of respondents were in disagreement (Mean=3.46; SD = .962). This implies that the management of most TVET institutions are conscious of the challenges that would act as barriers to effective implementation of e-learning. Therefore, as solutions are provided the institutional management support should accurately address the management-oriented challenges.

Further, 64.3% of respondents agreed that the trainers are adequately motivated to take part in e-learning, while 20.6% of the respondents were in disagreement and 14.9% undecided (Mean=3.78; SD=1.333). This implies that in the TVET institutions in Uasin Gishu County the trainers have a responsibility of motivating their students to e-learning in electrical and electronics engineering which would guarantee success in its implementation.

In terms of the management providing a facilitating environment for e-learning 70.1% of respondents were in agreement while 20.7% were in disagreement and 9.2% of the respondents were undecided, (Mean=3.71; SD=1.099). This implies that majority of the TVET institutions in Uasin Gishu County are keen on providing a conducive environment for e-learning which is key for its success. Thus, the general perception of the trainers of

electrical and electronic engineering is that there is institutional management support for the implementation of e-learning in TVET institutions in Uasin Gishu County (Mean=3.55; SD=.0744). However, there is a need for strengthening of institutional management support to give impetus to the implementation of e-learning. Therefore, the TVET institutions should carefully consider providing adequate financial allocation for e-learning activities and other management-oriented challenges to propel the e-learning challenges in electrical engineering in TVET institutions. This in line with the suggestion of Okumu and Kenei, (2022) the need for institutional management support was low and was a clear indication that the e-readiness of the TVET institutions was still low.

From the interview schedule one of the HoDs noted that:

"Our institutional management provides our department with the adequate administrative support in terms of financing e-learning activities in electrical engineering. However, the resource provision is sometimes inadequate and unreliable"

4.5.2 Descriptive Statistics of Infrastructure

Eight questionnaire items were used to examine the prevailing status of infrastructure in implementation of e-learning in TVET institutions in Uasin Gishu County.

Table 4.12: Results of Descriptive Analysis of Infrastructure

Statements	SD	D	UD	A	SA	Mean	Std. Deviation
E-Learning courses are seamlessly accessed by students because of a good bandwidth	3.4	42.5	4.6	25.3	24.1	3.24	1.320
There is a quick response time in uploading and retrieving content	10.3	24.1	0.0	49.4	16.1	3.37	1.295

Fast processing requests are facilitated by available core processors	2.3	19.5	8.0	46.0	24.1	3.70	1.111
There is high performance feature for learning based on the servers	3.4	42.5	4.6	25.3	24.1	3.24	1.320
The learning Management System platform can be effectively accessed	10.3	24.1	0.0	49.4	16.1	3.37	1.295
Knowledge sharing and interaction is promoted by the available e-learning tools	0.0	0.0	11.5	37.9	50.6	4.39	.688
Electronic learning equipment provided by the institution are sufficient	2.3	18.4	8.0	47.1	24.1	3.72	1.096
Uninterruptible Power Supply (UPS) is available	10.3	24.1	0.0	49.4	16.1	3.37	1.295
Average Mean						**3.55**	**0.849**

Results presented in Table 4.12 reveals that most respondents were in agreement at 49.9 % that there is a good bandwidth to help users' access e-Learning courses seamlessly, while 45.9% were in disagreement and 4.6 % undecided (Mean=3.24 SD=1.320). As much as majority are in agreement of the availability of the bandwidth, equally there are dissenting voices on the same in some of the institutions. This is a wakeup call for TVET institutions to improve on their internet speed which is one of the Key resources for e-learning. Bandwidth availability and capacity determines how students learn whether in online, blended, and face-to-face initiatives, whether instruction is traditional and didactic or more student-centered and differentiated, and whether online or blended learning is truly differentiated through the use of various media (Burns, 2014).

The respondents were also in agreement at 65.5% that there is a quick response time in uploading and retrieving content while 34.4% were in disagreement (Mean=3.37 SD=1.295).

This implies that there is efficiency in terms of dissemination of knowledge and getting assignments from students which are key in ensuring learning progresses. However, for the institutions represented by the 34.4% who were not satisfied with the speed of uploading and retrieving content the management should put in place corrective measures for fluency in e-learning in electrical engineering. When designing e-learning there is need to consider technical aspects (e.g., hardware and software requirements and speed of Internet connection) (Al-araibi, Mahrin, & Yusoff, 2019). Trainers were in agreement at 70.1% that the core processors have a fast-processing speed for requests while 21.8% were in disagreement and 8.0% undecided (Mean=3.70; SD=1.111). The trainers were in agreement at 49.4 % that the servers had a high-performance feature for learning while 45.9% were in disagreement, 4.6% undecided (Mean=3.24; SD=1.320). Besides 65.5% of the trainers were in agreement that they can effectively access the Learning Management System platform while 34.4% were in disagreement (Mean=3.37; SD=1.295). There is need for revamping the

LMS was adopted by the TVET institutions for access by the trainers and created a Learner-Centric Experience for effective e-learning in electrical and electronic engineering. A good LMS does three things effectively: engages individual learners, tracks learners' progress, and provides room to grow (Singh, Steele, & Singh, 2021).

In terms of the availability of communication tools to students and staff in the institution for the purposes of knowledge sharing and interaction most respondents were in agreement at 88.5%, and 11.5 % were undecided (Mean=4.39; SD=.688). Further, 71.2% of respondents were in agreement that there is sufficient electronic learning equipment while 20.7% were in disagreement and 8.0 % were undecided (Mean=3.72; SD=1.096). According to 65.5% of the respondents the TVET institutions have adequate Uninterruptible Power Supply (UPS) apparatus while 34.4% strongly disagreed (Mean=3.37; SD=1.235). Thus, the general

perception of the trainers of electrical and electronic engineering is that their infrastructure for the implementation of e-learning in TVET institutions in Uasin Gishu County is based on the overall of (Mean=3.55; SD=0.849). Despite this, there is a need for provision of more efficient and effective infrastructure for the implementation of e-learning. Nyongesa, Mabele, and Murunga (2022) also notes that there is need for improvement of digital infrastructure in TVET institutions to promote e-learning. Bastola, Ameenb, and Isaacc, (2019) established that digital infrastructure is very critical in implementation of effective e-learning

From the interviews one of the HODs noted that:

"Our institution enhances the efficiency of e-learning infrastructure in terms of effective use of shift learning, projectors, computers and smart boards. However, the platforms and software need to be updated to meet the demands of electrical and electronics engineering"

Besides, another HoD noted that:

"Some of the lecture rooms where theory lessons are carried out are not ICT compliant since power sockets are inadequate, lacked projector screen and not properly secured to install ICT facilities"

4.5.3 Descriptive Statistics for ICT Competence

Training ICT competency is a vital capacity required to implement ICT in teaching and learning. Lack of proficiency with ICT-related tasks and ICT software tools and appliances creates lack of confidence in using ICT (Mwenisongole, 2021). In this respect six questionnaire items were used to examine the prevailing status of Trainers ICT competency in training electrical and electronic engineering in TVET institutions in Uasin Gishu County.

Table 4.13: Results for Descriptive Analysis of ICT Competence

Statements	SD	D	UD	A	SA	Mean	Std. Deviation
I am capable of creating interactive learning platforms for electrical engineering	10.3	24.1	0.0	49.4	16.1	3.37	1.295
I am familiar with ICT tools, and special usage patterns for teaching electrical engineering	4.6	18.4	10.3	36.8	29.9	3.69	1.213
I am competent in educational practices and strategies on ICT application	8.0	14.9	10.3	43.7	23.0	3.59	1.225
The learners have the necessary ICT-related skills for e-learning	3.4	42.5	4.6	25.3	24.1	3.24	1.320
There is an emphasis on the learner's capabilities on ICT Development	10.3	24.1	0.0	49.4	16.1	3.37	1.295
Online course design and online teaching instructional guidance is accessible to academic staff	10.3	24.1	0.0	49.4	16.1	3.37	1.295
Average Mean						**3.43**	**.928**

Results presented in Table 4.13 revealed that 65.5% of trainers were in agreement that they are capable of creating interactive learning platforms for electrical engineering while 34.4% disagreed (Mean=3.37 SD=1.295). This implies that the trainers and students are capable of uploading their multimedia content in terms of assignments and notes. Interactive learning content increases the depth of learning and provides students with a method for approaching independent practice (Bailey, Almusharraf, & Hatcher, 2021). 66.7% of trainers were in agreement that they are familiar with ICT tools, and special usage patterns for teaching electrical engineering while 23.0% were in disagreement and 10.3% were undecided

(Mean=3.69 SD=1.213). In addition, 66.7% of the trainers of electrical and electronic engineering were in agreement that they are competent in educational practices and strategies on ICT application while 22.9% were in disagreement and 10.3% were undecided, (Mean=3.59 SD=1.225). The competence in educational practices and strategies for ICT application creates learners who are actively engaged with learning objectives. This remains key in creating pathways for differentiated instruction to meet the unique needs of students as individual learners within a broader classroom climate (McKnight et al., 2016).

Besides, 49.4% of the trainers were in agreement that learners have the necessary ICT-related skills for e-learning while 45.9% were in disagreement and 4.6% were undecided (Mean=3.24 SD=1.320). According to 65.5% of the respondent's development of learner's capabilities in ICT is emphasized while 34.4% were in disagreement (Mean=3.37 SD=1.295). Learner capabilities in ICT remains instrumental because technology gives students access to a variety of programs and information sources at the simple click of a button (Darling-Hammond et al., 2020)

Trainers are also in agreement that instructional guidance is easily accessible to academic staff about online course design and online teaching (Mean=3.37 SD=1.295). Thus, the general perception of the respondents is that there is ICT competence amongst the trainers and the trainees for implementation of e-learning (M=3.43 SD=.928). However, there is a need for continuous capacity building on ICT hardware and software to enhance their competence in electrical and electronic engineering content delivery. This need is further corroborated by the interview findings that some of the trainers and trainees face challenges in enhancing ICT competence of both the trainers and trainees. One of the respondents noted that:

"Most of the TVET institutions are facing the challenges of an enabling ICT training environment, through provision of necessary electricity and bandwidth infrastructure, within which a broader array of eLearning activities may become viable. Besides there is an inadequacy of well-designed instructional content particularly in the TVET education sub sector which can strengthen the use of e-learning in electrical and electronics engineering"

4.5.4 Descriptive Statistics for Organizational Learning Culture

In the context of e-learning, OLC emphasizes the need to foster a culture of knowledge generation and sharing and mutual assistance, and the fulfillment of organizational goals. It is critical to adapt OLC to ELS solutions while designing and implementing them to eliminate potential conflict. In this regard five questionnaire items were used to examine the prevailing status of organizational learning culture in TVET institutions in Uasin Gishu County.

Table 4.14: Results for Descriptive Analysis of Organizational Learning Culture

Statements	SD	D	UD	A	SA	Mean	Std. Deviation
Ability for innovation is encouraged by the institution	4.6	37.9	16.1	33.3	8.0	3.02	1.110
There is a commitment to learning and al-location of resources to trainers by the institution	9.2	62.1	3.4	17.2	8.0	2.53	1.129
Leadership promotes knowledge sharing	0.0	36.8	13.8	31.0	18.4	3.31	1.154
There is continuous learning amongst trainers on e-learning	4.6	10.3	5.7	52.9	26.4	3.86	1.069
Knowledge sharing on e-learning is encouraged amongst trainers	5.7	12.6	20.7	49.4	11.5	3.48	1.044
Average Mean						**3.20**	**.713**

Results presented in Table 4.14 revealed that 41.3% of trainers were in agreement that the institution encourages ability for innovation while 42.5% were in disagreement and 16.1% undecided (Mean=3.02 SD=1.110). This implies that TVET institutions in Uasin Gishu County have low organizational learning in terms of promotion of ability for innovation amongst trainers to infuse innovation capabilities amongst trainees. This is in line with the findings of Cheruiyot, (2022) that the major challenges in the Kenyan TVET system is lack of quality training, none utilization of innovation techniques, not performing practical experiments and also not using information communication technology fully for entrepreneurial skills development. Therefore, the TVET institutions should steer learning ability for purposes of enhancing innovative capabilities amongst the trainers and trainees. Majority of the trainers at 72.3% of the trainers were in disagreement that the institutions were committed to learning and allocation of resources to employees learning while 25.2% of the respondents were in agreement and 3.4 % undecided (Mean=2.53 SD=1.129). This leaves a gap in the attainment of the aspirations of TVET which is rendering quality education and training programs to promote poverty alleviation and sustainable development in a constantly changing technological environment. This remains elusive without trainers who have gaps in knowledge in terms of emerging trends in technology which should be imparted on students. Therefore, there is a need for addressing the necessary skill gaps amongst the trainers by provision of the requisite resources learning **(**www.ilo.org, 2021). New job roles and forms of work organization place fresh demands on enterprise human resource practices, affecting talent management and staff development practices in all firms.

Therefore, providing resources for the education and training products and services for the trainers to respond to the demand and develop the skills required is necessary. In addition, 49.4% of the trainers were in agreement that leadership promotes knowledge sharing while 36.8% were in disagreement and 13.8% undecided (Mean=3.31 SD=1.154). Based on the

numbers of trainers who are in disagreement, there is a need for the leaders in TVET to create a sense of urgency around knowledge sharing amongst its staff by emphasizing its importance and its direct impact on the trainees. Chuang, Jackson, and Jiang (2016) notes that leaders can encourage their teams to share their knowledge and expertise by recognizing and rewarding those who actively participate in knowledge sharing activities. According to 79.3% of the trainers there is continuous learning amongst employees while 14.9% were in disagreement and 5.7% were undecided (Mean=3.86 SD=1.069). This implies that in a majority of TVET institutions there is continuous learning of the trainers. 60.9% were in agreement that Knowledge sharing is encouraged while 18.3% were in disagreement, 20.7% were undecided (Mean=3.48 SD=1.044). Thus, the general perception of the respondents is that there is an organizational learning culture for implementation of e-learning (M=3.20 SD=.713).

From the interview schedule, on how does the Leadership of your institution promote knowledge sharing among its staff and trainees. One of the respondents noted that;

"Employees are encouraged to use digital platforms for sharing best knowledge and practices. The trainers and trainees are also encouraged to share their research and innovative ideas and attend conferences and trade exhibitions"

4.5.5 Descriptive Statistics for Implementation of E-Learning in TVET institutions

Six questionnaire items were used to examine the prevailing status of Implementation of E-Learning in TVET institutions in Uasin Gishu County.

Table 4.15: Results for Descriptive Analysis of Implementation of e-Learning in TVET institutions

Statements	SD	D	UD	A	SA	Mean	Std. Deviation
Data of electronic teaching materials are used to build most of the lessons	0.0	2.3	29.9	59.8	8.0	3.74	.637
I always use e-teaching	2.3	36.8	11.5	31.0	18.4	3.26	1.205
Newly acquired knowledge online is effectively applied	4.6	9.2	29.9	40.2	16.1	3.54	1.021
Specific tasks as learnt through e-platforms are performed by learners	3.4	6.9	57.5	29.9	2.3	3.21	.749
Learners are engaged with the learning material during the learning process	0.0	36.8	13.8	31.0	18.4	3.31	1.154
The platforms are easy to use	10.3	25.3	0.0	48.3	16.1	3.34	1.301
Average Mean						**3.40**	**.631**

Results presented in Table 4.15 revealed that 67.8% of the trainers were in agreement that almost all lessons are built using the data of electronic teaching materials while 2.3% were in disagreement, 29.9% were undecided (Mean=3.74 SD=.637). 49.4% of the trainers were in agreement that they always use e-teaching while 39.1% disagree and 11.5% were undecided (Mean=3.26 SD=1.205). This is an index of effective implementation of e-learning in TVET institutions because of the frequency of use of the e-learning in teaching. The trainers have effectively integrated technology in their teaching however there is need for continued capacity building amongst trainers on the use of technology and provision of resources for all of them to always use e-teaching. This is because the use of technology in education is just as

significant as other teaching assistance instruments in class for facilitating and developing students' learning of a certain topic taught in class (Hashim, 2015). However, 56.3% of trainers agreed that there is successful application of newly acquired knowledge online, whereas 13.8% disagreed and 29.9% were undecided (Mean=3.54 SD=1.021).

32.2% of the trainers were in agreement that learners are able to continuously perform specific tasks as learnt through e-platforms while 10.3% were in disagreement and 57.5% undecided (Mean=3.21 SD=.749). In this regard there is a need for the use of technologies and resources in a pedagogically effective manner so as to make it also easy for more students to apply what they have learnt online. Effective online education entails more than simple online content delivery. High-quality e-learning is flexible, interactive, inclusive and student-centered (Hodges et al, 2020). Making the learning more student centered will guarantee an improvement of the rate of knowledge acquisition and application through e-learning. This warrants further developing trainers' skills and competencies in applying new pedagogical approaches, instructional tools and/or educational technologies to deliver learner-centered teaching and training which builds learners' digital competencies and future-oriented skills (UNESCO, 2022).

According to 49.4% of the trainers the learners are engaged with the learning material during the learning process, while 36.8% were in disagreement and 13.8 % undecided (Mean=3.31 SD=1.154). This is crucial because getting students involved in the learning process sharpens their attention, encourages them to pay attention, and inspires them to apply higher-order critical thinking. Engaging Instructional materials make learning more interesting, practical, realistic and appealing (Ajoke, 2017). They also enable both the teachers and students to participate actively and effectively in lesson sessions. Therefore, the trainers should consistently make the e-learning materials more engaging so as to achieve its purpose. From

the findings trainers were also in agreement at 64.4% that the platforms are easy to use while 35.6% were in disagreement (Mean=3.34 SD=1.301). Thus, the general perception of the respondents is that there is an implementation of e-learning (M=3.40 SD=.631). This is an index of effective application of e-learning in electrical engineering if the majority of the trainers find it easy to use. Though there is need for improving on the ease of use of the technology for some of the trainers who are not able to use to easily use the website, whether that's clicking around, reading and manipulating of content to the needs of the student, completing a task or loading a page for effective implementation of e-learning by all trainers in TVET. Therefore, measures should be taken to ensure the right technology used in e-learning by the TVET institutions and developing *TVET* trainers' basic and advanced digital skills (Yeap, Suhaimi, & Nasir, 2021).

4.6 Assumptions of Multiple Regression Analysis

Multiple regression was used to determine factors that influence implementation of e-learning in TVET institutions in Uasin Gishu County. However, before regression analysis was conducted, assumptions of multiple regression analysis were first tested.

4.6.1 Assumption of Normality

Skewness and Kurtosis statistics were used to determine data normality (Jammalamadaka, Taufer, & Terdik, 2021). Data skewness values must be between +1.00 and -1.00, and kurtosis values must be between +3.00 and -3.00, according to Liang, Tang, and Zhao (2019). If both conditions are passed, the data can be regarded normally distributed rather than skewed.

Table 4.16: Test Results of Normality

Construct	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Institutional management support	152	-.177	.258	.586	.511
Infrastructure	152	-.316	.258	-.403	.511
ICT Competence	152	-.621	.258	.167	.511
Organization Learning Culture	152	-.304	.258	1.344	.511
Implementation of e-learning	152	-.126	.258	-.537	.511

The results in Table 4.16 show that the normalcy assumption was supported. Skewness and Kurtosis values did not fall outside of the specified ranges. When a distribution has negative skewness (left-skewness), the left tail is longer than the right tail; negatively skewed distributions usually produce positive results. Tails in distributions with low kurtosis less than 3.0 (platykurtic) are often less severe ("skinnier") than tails in the normal distribution. This means that there will be less extreme good or negative incidents. Chen (2023) asserts that the bigger the deviation from the mean, in this situation, the greater the possibility that the respondents strongly agree or strongly disagree, and that a low standard deviation indicates

that there was a high level of agreement about the answers. A high SD indicates that there was a wide range of responses, indicating disagreement. As a result, histograms in Figures 4.1 to 4.5 were used in the study to test for normalcy. The researcher assessed the data by determining how far it strayed from a bell-shaped normal distribution.

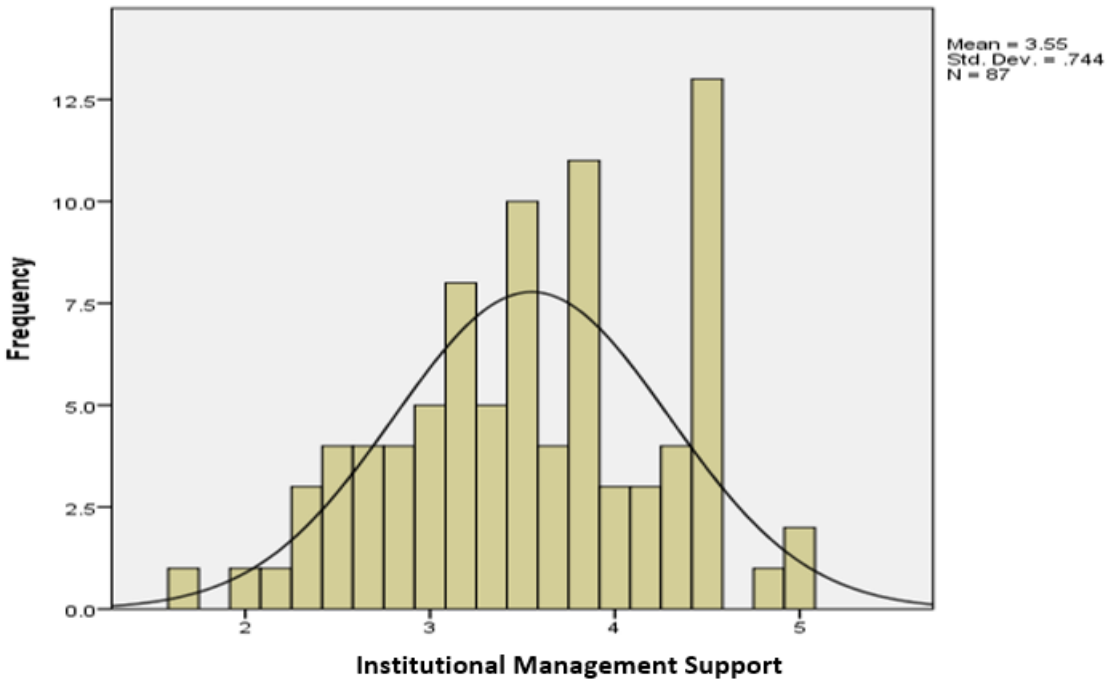


Figure 4.1 Institutional Management Support

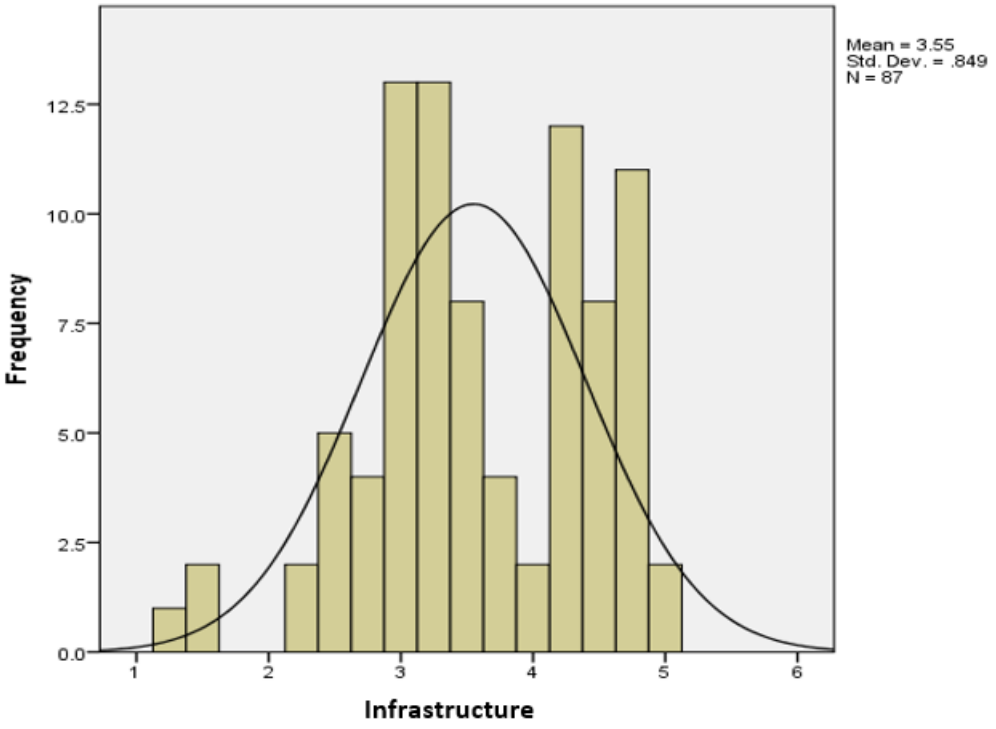


Figure 4.2 Infrastructure

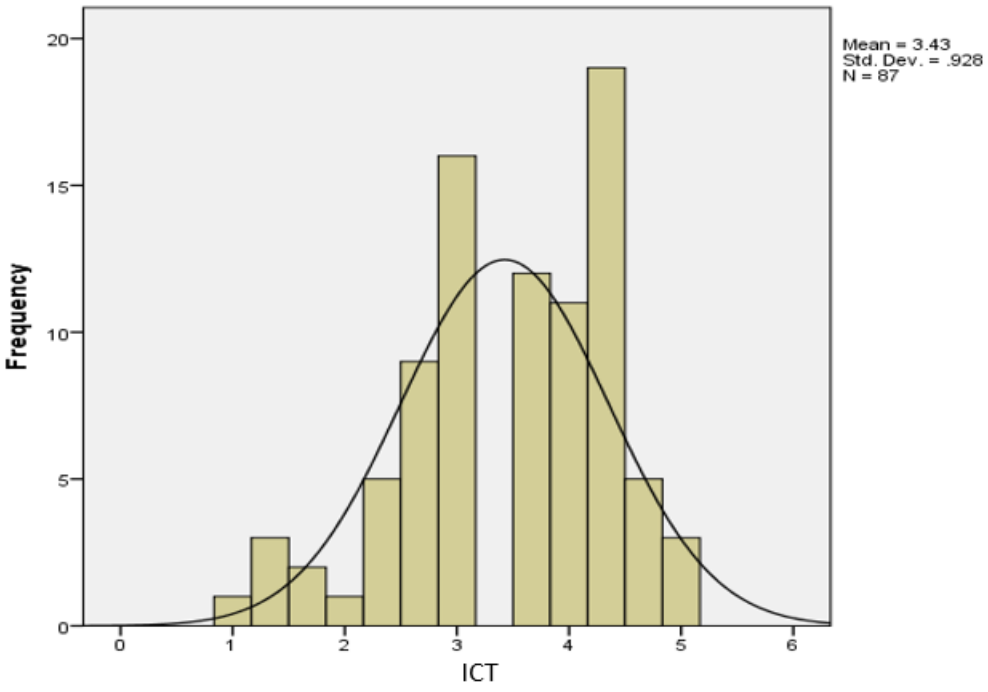


Figure 4.3 ICT competence

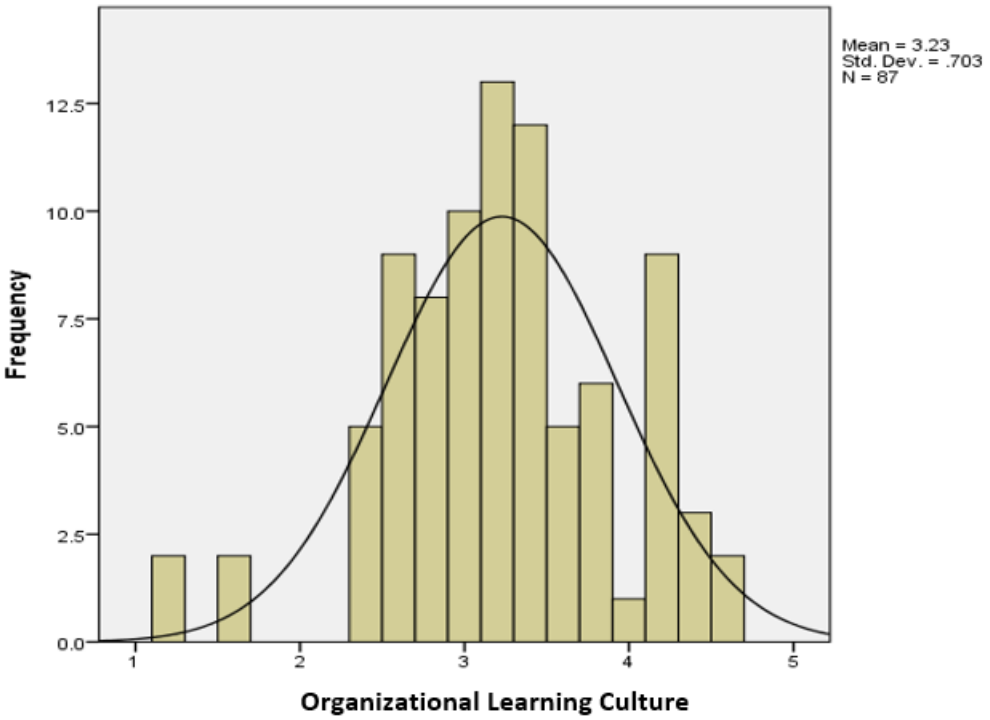


Figure 4.4 Organizational Learning Culture

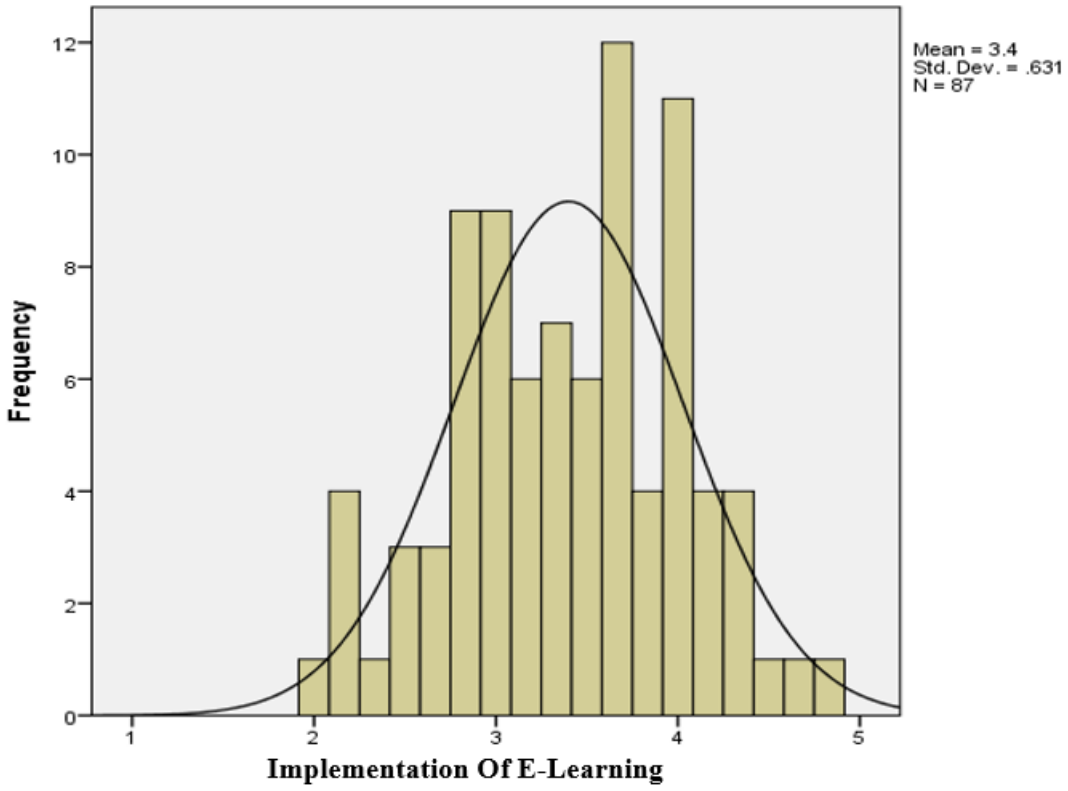


Figure 4.5 Implementation of E-Learning

4.6.2 Multicollinearity

Multicollinearity was tested using variance inflation factor (VIF) and tolerance as depicted in table 4.17.

Table 4.17: Multicollinearity

Model	Collinearity Statistics	
	Tolerance	VIF
Institutional management Support	.313	3.195
Infrastructure	.149	6.727
ICT competence	.229	4.359
Organization learning Culture	.773	1.294

Dependent Variable: Implementation of e-learning

The Variance Inflation Factor (VIF) measures the impact of collinearity among the variables in a regression model. Values of VIF that exceed 10 are often regarded as indicating multicollinearity (Ullah, Aslam, Altaf & Ahmed, 2019). A VIF less than 5 indicates a low correlation of that predictor with other predictors. A value between 5 and 10 indicates a moderate correlation, while VIF values larger than 10 are a sign for high, not tolerable correlation of model predictors (Raykov & Marcoulides, 2019). Institutional management Support (VIF =3.195, Tolerance=.313) implies that there was no multicollinearity between Institutional management Support and other predictors in the model. Infrastructure (VIF =6.727, Tolerance=.149) implies that there was no multicollinearity between Infrastructure and other predictors in the model. ICT competence (VIF =4.359, Tolerance=.229) implies that there was no multicollinearity between ICT competence and other predictors in the model. Organization learning Culture (VIF =1.294, Tolerance=.773) implies that there was no Organization learning Culture between ICT competence and other predictors in the model.

Organization learning Culture ICT competence, had VIF of less than five with other predictors indicating a low correlation while infrastructure had VIF above five thus moderate correlation with other predictors hence no multicollinearity. All variables involved in the linear relationship had a small tolerance. Some suggest that a tolerance value less than or equal to 1 (Tamura et al., 2017). According to table 4.10 Variance Inflation Factor (VIF), Tolerance is within the threshold ranges hence no multicollinearity.

4.6.4 Correlation Analysis

Pearson's correlation coefficients were used to test linearity assumption. The purpose of using correlation was to identify factors that influence implementation of e-learning in TVET institutions in Uasin Gishu County which provide best predictions for conducting regression analysis.

Table 4.18: Correlation Matrix

		Institutional management Support	Infrastructure	ICT competency	Organizational Learning Culture	Implementation of e-learning
Institutional management Support	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	87				
Infrastructure	Pearson Correlation	.826**	1			
	Sig. (2-tailed)	.000				
	N	87	87			
ICT competency	Pearson Correlation	.704**	.874**	1		

	Sig. (2-tailed)	.000	.000			
	N	87	87	87		
Organizational Learning Culture	Pearson Correlation	.413**	.445**	.459**	1	
	Sig. (2-tailed)	.000	.000	.000		
	N	87	87	87	87	
Implementation of e-learning	Pearson Correlation	.647**	.670**	.790**	.648**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	87	87	87	87	87

**. Correlation is significant at the 0.01 level (2-tailed).

The inter-correlations among the variables are shown in Table 4.18. The results indicate correlations among the factors that influence implementation of e-learning were significant. Correlations between institutional management support (r=.647**) and implementation of e-learning is positive and significant. These findings are supported by Liu, Huang, and Lin, (2012) (Almaiah and Almulhem, (2018) who also found a significant influence institutional management support has a positive and significant effect on implementation of e-learning in teaching electrical and electrical engineering. Infrastructure (r= .670**) this implies that infrastructure had a positive and significant correlation between infrastructure and implementation of e-learning. These findings are supported by Mulwa and Kyalo, (2011), Keramati et al (2011), Mwangi (2017); Kiget, Wanyembi and Peters (2014) who also found a positive and significant correlation with implementation of e-learning in teaching electrical and electrical engineering. ICT competency (r=.790**) has a positive and significant correlation with implementation of e-learning. These findings are supported by Amini and Oluyide (2020); Roszak and Kolodziejczak (2017) and Bariu, Xiong and Azzeddine (2022)

who also found that ICT competence has a positive and significant correlation with implementation of e-learning.

Finally organizational learning culture ($r=.648^{**}$), is positively and significantly related to implementation of e-learning in TVET institutions where $P<0.01$. These findings are supported by Sonatha and Azmi, (2020); Lin, Huang & Zhang (2019); Hosseini, Salimifard, and Yadollahi, (2017) who also found that organizational learning culture has a positive and significant correlation with implementation of e-learning. Linearity assumption was therefore satisfied because the data followed a linear relationship. This implies that all the factors under study jointly have a positive and significant influence on implementation of e-learning in TVET institutions as such it behooves the management of TVET institutions to pay high premiums on these factors to ensure effective implementation of e-learning in TVET.

4.7 Regression Analysis

The study identified institutional management support, infrastructure, ICT competency and organizational learning culture as the imperative factors that influence implementation of e-learning in TVET institutions. These independent variables were then subjected to simple regression analysis and multiple regression analysis (MRA) to establish their influence on implementation of e-learning in TVET institutions, which was the dependent variable.

4.7.1 Influence of institutional management support on implementation of e-learning in TVET institutions

The model summary presented in table 4.19 involves institutional management as the only independent variable.

Table 4.19: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.647[a]	.418	.412	.484	1.528

a. Predictors: (Constant), Institutional management Support

b. Dependent Variable: Implementation of e-learning

The coefficient of determination (R square) of 0.418 indicated that the model explained only 41.8 % of the variation or change in the dependent variable with the remainder of 58.2 % explained by other factors other than institutional management support. Therefore, institutional management support explains 41.8 % variability of implementation of e-learning

in TVET institutions. Adjustment of the R square did not change the variability substantially, having reduced the explanatory behavior of the institutional management support to 41.2%. Second, the ANOVA output was examined to check whether the proposed model was viable.

Table 4.20 ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	14.330	1	14.330	61.171	.000[b]
	Residual	19.912	85	.234		
	Total	34.242	86			

a. Dependent Variable: Implementation of e-learning

b. Predictors: (Constant), Institutional management Support

Results shown in Table 4.20 reveal that the F-statistic was highly significant (F= 61.171 $p<0.05$), this shows that the model was valid. The regression model significantly improved the ability to predict implementation of e-learning. Thus, based on the research question and (F= 61.171 $p<0.05$) institutional management support significantly influences the implementation of e-learning in TVET institutions in Uasin Gishu County.

4.7.1.1 Regression Coefficients of Implementation of e-learning as explained by Institutional Management Support

Results of the regression coefficients presented in Table 4.21.

Table 4.21: Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	1.450	.254		5.698	.000		
Top Mgt Support	.549	.070	.647	7.821	.000	1.000	1.000

a. Dependent Variable: Implementation of e-learning

Table 4.21 shows the estimates of β values and gives an individual contribution of a predictor to the model. The β value tells us about the relationship between implementation of e-learning with the predictor. The positive β value indicates a positive relationship between the predictors and the outcome. The β value for implementation of e-learning (.647) was positive. The positive β values indicate the direction of relationship between predictor and outcome. From the results (Table 4.15) the model was then specified as: -

$$y= \beta_1 X_1 + \varepsilon$$ **……Equation 4.1**

Implementation of e-learning = .647 Institutional management Support + ε

The coefficient of the variable indicates the amount of change one could expect in Implementation of e-learning given a one-unit change in institutional management support basing on the standardized coefficients. Result reveals standardized regression coefficient for Institutional management support (β=0.647), implies that an increase of 1 standard deviation in institutional management support is likely to result in 0.647 standard deviations increase in Implementation of e-learning. T-test was used to identify whether the predictor was making a significant contribution to the model. When the t-test associated with β value is significant then the predictor is making a significant contribution to the model. The results show that institutional management support is (t =7.821, P<.05). In this regard the research question

was answered that institutional management support significantly influences the implementation of e-learning in TVET institutions in Uasin Gishu County.

These findings are supported by Liu, Huang, and Lin, (2012) (Almaiah and Almulhem, (2018) who also found a significant influence institutional management support has a positive and significant effect on implementation of e-learning in teaching electrical and electrical engineering. The findings are based on the diffusion of Innovation theory because adoption of technology for e-learning by TVET institutions would be optimal and enhanced through institutional management support to positively impact on teaching electrical and electronic engineering. The institutional management must have the ability to create and communicate the vision for e-learning, implement e-learning, and guide e-learning through its growth process (Clark & Mayer, 2016). The management needs to analyze external and internal environmental factors affecting the institution's capacity to effectively implement e-learning for electrical and electronics engineering and fill the gaps effectively. However, from the descriptive analysis TVET institutions offering electrical engineering in Uasin Gishu County decry lapses in financial allocation for e-learning activities and delayed budgetary approval for undertaking e-oriented electrical and electronic engineering which is a prerogative of the top management.

4.7.2 Influence of infrastructure on implementation of e-learning in TVET institutions in Uasin Gishu County

The model summary presented in table 4.22 involves infrastructure as the only independent variable.

Table 4.22: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.670[a]	.449	.442	.471	1.597

a. Predictors: (Constant), Infrastructure

b. Dependent Variable: Implementation of e-learning

The coefficient of determination (R square) of 0.449 indicated that the model explained only 44.9 % of the variation or change in the dependent variable with the remainder of 55.1 % explained by other factors other than infrastructure. Adjustment of the R square did not change the results substantially, having reduced the explanatory behavior of infrastructure on implementation of e-learning to 44.2%. Second, the ANOVA output was examined to check whether the proposed model of effect of infrastructure on implantation of e-learning was viable.

Table 4.23 ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	15.373	1	15.373	69.252	.000[b]
	Residual	18.869	85	.222		
	Total	34.242	86			

a. Dependent Variable: Implementation of e-learning

b. Predictors: (Constant), Infrastructure

Results shown in Table 4.23 reveal that the F-statistic was highly significant (F= 69.252 $p<0.05$), this shows that the model was valid. The model significantly improved the ability to predict implementation of e-learning. The regression model as a whole was useful in explaining the ability of infrastructure to predict the implementation of e-learning.

4.7.2.1 Regression Coefficients of Implementation of e-learning as explained by Infrastructure

Results of the regression coefficients were presented in Table 4.24.

Table 4.24: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.925	.180		10.683	.000		
	Infrastructure	.533	.046	.691	11.705	.000	1.000	1.000

a. Dependent Variable: Implementation of e-learning

Shows the estimates of β values and gives an individual contribution of a predictor to the model. The β value shows the relationship between implementation of e-learning with the predictor. The positive β value indicates a positive relationship between the predictors and the outcome. The β value for Implementation of e-learning (.670) was positive. The positive β values indicate the direction of relationship between predictor and outcome. From the results (Table 4.18) the model was then specified as: -

$$y= \beta_1 X_1+\varepsilon$$ **……Equation 4.2**

Implementation of e-learning = .670 Infrastructure + ε

From Table 4.24, the coefficient of the variable indicates the amount of change one could expect in implementation of e-learning given a one-unit change in infrastructure based on the standardized coefficients. Result reveals standardized regression coefficient for infrastructure (β=0.670), implies that an increase of 1 standard deviation in infrastructure is likely to result in 0.670 standard deviations increase in implementation of e-learning. T-test was used to identify whether the predictor was making a significant contribution to the model. When the t-test associated with β value is significant then the predictor is making a significant contribution to the model. The results show that infrastructure is ($t = 8.322$, $P < .05$). In this regard the research question was answered that infrastructure significantly influences implementation of e-learning in TVET institutions in Uasin Gishu County.

These findings are supported by Mulwa and Kyalo, (2011), Keramati et al (2011), Mwangi (2017); Kiget, Wanyembi and Peters (2014) who also found a positive and significant influence on implementation of e-learning in teaching electrical and electrical engineering. The findings are based on the diffusion of Innovation theory because adoption of technology for e-learning by TVET institutions would be optimal and enhanced through infrastructure to positively impact on teaching electrical and electronic engineering. The e-learning infrastructure includes Learning Management System (LMS), electronic devices, communication applications, and internet accessibility (Garad, Al-Ansi, & Qamari, 2021). Effective e-learning infrastructure allows students and lecturers to interact quickly and easily for effective learning. Effective e-learning infrastructure allows students and lecturers to interact quickly and easily for effective learning. Infrastructure (connectivity, sources of energy and e-equipment) have a significant influence on readiness to adopt e-learning (Mulwa & Kyalo, 2011). However, from descriptive analysis the respondents were undecided on the goodness of the bandwidth to help users' access e-Learning courses seamlessly and performance of servers for learning. This calls for improvement of the adequacy of

infrastructure for effective implementation of e-learning in electrical and electronic engineering.

4.7.3 Influence of ICT competency on implementation of e-learning in TVET institutions in Uasin Gishu County

The model summary presented in table 4.25 involves ICT competency as the only independent variable.

Table 4.25: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.790[a]	.623	.619	.389	1.542

a. Predictors: (Constant), ICT competency

b. Dependent Variable: Implementation of e-learning

In table 4.25 the coefficient of determination (R square) of 0.623 indicated that the model explained only 62.3 % of the variation or change in the dependent variable with the remainder of 37.7% explained by other factors other than ICT competency. Adjustment of the R square did not change the results substantially, having reduced the explanatory behavior of the ICT competency on implementation of e-learning to 61.9%. Second, the ANOVA output was examined to check whether the proposed regression model was viable presented in table 4.26.

Table 4.26 ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	21.347	1	21.347	140.717	.000[b]
	Residual	12.895	85	.152		
	Total	34.242	86			

a. Dependent Variable: Implementation of e-learning

b. Predictors: (Constant), ICT competency

Results shown in Table 4.26 reveal that the F-statistic was highly significant (F= 140.717 $p<0.05$), this shows that the model was valid. The model significantly improved the ability to predict implementation of e-learning. Thus, the model was significant. The regression model as a whole was useful in explaining the ability of ICT competency to predict the implementation of e-learning.

4.7.3.1 Regression Coefficients of Implementation of e-learning as explained by ICT competency

Results of the regression coefficients presented in Table 4.27.

Table 4.27: Regression Coefficients of implementation of e-learning as explained by ICT competency

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.559	.161		9.711	.000		
	ICT competency	.537	.045	.790	11.862	.000	1.000	1.000

a. Dependent Variable: Implementation of e-learning

The findings in table 4.27 show that the estimates of β values give an individual contribution of a predictor to the model. The β value tells us about the relationship between implementation of e-learning with the predictor. The positive β value indicates a positive relationship between the predictors and the outcome. The β value for Implementation of e-learning (.790) was positive. The positive β values indicate the direction of relationship between predictor and outcome. From the results (Table 4.21) the model was then specified as: -

$$\mathbf{y= \beta_1 X_1 + \varepsilon}\text{.....Equation 4.2}$$

Implementation of e-learning = .790 ICT competency + ε

The coefficient of the variable indicates the amount of change one could expect in implementation of e-learning given a one-unit change in ICT competency based on the standardized coefficients. Result reveals standardized regression coefficient for ICT competency (β=0.790), implies that an increase of 1 standard deviation in ICT competency is likely to result in 0.790 standard deviations increase in implementation of e-learning. T-test was used to identify whether the predictor was making a significant contribution to the model. When the t-test associated with β value is significant then the predictor is making a significant contribution to the model. The results show that ICT competency is (t =11.862, P<.05). In this regard the research question was answered that ICT competency significantly influences implementation of e-learning in TVET institutions in Uasin Gishu County.

These findings are supported by Amini and Oluyide (2020); Roszak and Kolodziejczak (2017) and Bariu, Xiong and Azzeddine (2022) who also found that ICT competence has a positive and significant influence on implementation of e-learning. Therefore, the study

concludes that teachers' and trainers ICT competency is a vital capacity for the implementation of e-learning in teaching electrical and electrical engineering. In the converse, incompetence in ICT-related tasks and ICT software tools and appliances leads to resistance to effective adoption of e-learning in teaching. ICT integration in engineering teaching improves and increases the quality, accessibility and cost-efficiency of the delivery of instruction to trainees, it also connects the learning population to face the challenges brought about by globalization. In this regard ICT competence amongst the trainees and trainers remains key in organizing workload, streamline processes and access digital information for effective implementation of e-learning in TVET institutions. This argument hinged on the diffusion of Innovation theory because adoption of technology for e-learning by TVET institutions in teaching electrical and electronic engineering would be enhanced through ICT competence of both the trainers and trainees. Therefore, the TVET institutions should ensure that all the electrical and electronics engineering trainers and students are equipped with the adequate knowledge and skills to manipulate both the electrical and electronic engineering ICT software and hardware for effective implementation of e-learning.

4.7.4 Influence of organizational learning culture on implementation of e-learning in TVET institutions

The model summary presented in Table 4.28 involves organizational learning culture as the only independent variable.

Table 4.28: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.648[a]	.420	.413	.483	1.684

a. Predictors: (Constant), Organizational Learning Culture

b. Dependent Variable: Implementation of e-learning

The coefficient of determination (R square) of 0.420 indicated that the model explained only 42 % of the variation or change in the dependent variable with the remainder of 58 % explained by other factors other than organizational learning culture. Adjustment of the R square did not change the results substantially, having reduced the explanatory behavior of the predictor to 41.3%.

Second, the ANOVA output was examined to check whether the proposed model was viable and results shown in Table 4.29.

Table 4.29 ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	14.377	1	14.377	61.519	.000[b]
	Residual	19.865	85	.234		
	Total	34.242	86			

a. Dependent Variable: Implementation of e-learning

b. Predictors: (Constant), Organizational Learning Culture

The findings in Table 4.29 revealed that the F-statistic was highly significant (F= 61.519 $p<0.05$), this shows that the model was valid. The model significantly improved the ability of organizational learning culture to predict implementation of e-learning. Thus, the model was significant. Thus, the model was significant. The regression model as a whole was useful in explaining the ability of organizational learning culture to predict the implementation of e-learning.

4.6.4.1 Regression Coefficients of Implementation of e-learning as explained by Organizational Learning Culture

Results of the regression coefficients presented in Table 4.30 show that the estimates of β values give an individual contribution of a predictor to the model.

Table 4.30: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.565	.239		6.538	.000		
	Organizational Learning Culture	.574	.073	.648	7.843	.000	1.000	1.000

a. Dependent Variable: Implementation of e-learning

The β value tells us about the relationship between Implementation of e-learning with the predictor. The positive β value indicates a positive relationship between the predictors and the outcome. The β value for Implementation of e-learning (.648) was positive. The positive β values indicate the direction of relationship between predictor and outcome. From the results (Table 4.15) the model was then specified as: -

$$y = \beta_1 X_1 + \varepsilon$$ **……Equation 4.1**

Implementation of e-learning = .648 Organizational Learning Culture + ε

The coefficient of the variable indicates the amount of change one could expect in Implementation of e-learning given a one-unit change in Organizational Learning Culture based on the standardized coefficients. Result reveals standardized regression coefficient for Organizational Learning Culture (β=0.648), implies that an increase of 1 standard deviation in Organizational Learning Culture is likely to result in 0.648 standard deviations increase in Implementation of e-learning. T-test was used to identify whether the predictor was making a significant contribution to the model. When the t-test associated with β value is significant then the predictor is making a significant contribution to the model. The results show that Organizational Learning Culture is ($t = 7.843$, $P < .05$). In this regard the research question was answered that Organizational Learning Culture significantly influences the implementation of e-learning in TVET institutions in Uasin Gishu County.

These findings are supported by Sonatha and Azmi, (2020); Lin, Huang & Zhang (2019); Hosseini, Salimifard, and Yadollahi, (2017) who also found that organizational learning culture has a positive and significant influence on implementation of e-learning. Key aspects of organizational learning are that learning happens when people interact while finding and solving problems. In the context of e-learning, OLC emphasizes the need to foster a culture of knowledge generation and sharing and mutual assistance, and the fulfillment of organizational goals. Organizational learning culture is an important factor in successful e-learning (Hosseini, Salimifard & Yadollahi, 2017). From the descriptives there was poor promotion of knowledge sharing by leadership of TVET, low encouragement of trainers and trainees' ability for innovation and committed to learning and allocation of resources to

employees learning. This calls for a need for instituting a potent organizational learning culture for effective implementation of e-learning.

4.7.5 Factors Influencing implementation of e-learning in TVET institutions

The model summary presented in table 4.31 involves factors Influence implementation of e-learning in TVET institutions.

Table 4.31: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.871[a]	.758	.746	.318	1.594

a. Predictors: (Constant), institutional management support, infrastructure, organizational learning culture and ICT competency

b. Dependent Variable: Implementation of e-learning

The coefficient of determination (R square) of 0.758 indicated that the model explained only 75.8 % of the variation or change in the dependent variable with the remainder of 24.2 % explained by other factors other than institutional management support, infrastructure, organizational learning culture and ICT competency. Adjustment of the R square did not change the results substantially, having reduced the explanatory behavior of the predictor to 74.6%.

Second, the ANOVA output was examined to check whether the proposed model was viable. Results shown in Table 4.32.

Table 4.32 ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	25.948	4	6.487	64.132	.000[b]
	Residual	8.294	82	.101		
	Total	34.242	86			

a. Dependent Variable: Implementation of e-learning

b. Predictors: (Constant), institutional management support, infrastructure, organizational learning culture and ICT competency

The findings revealed that the F-statistic was highly significant ($F= 64.132 p<0.05$), this shows that the model was valid. The model significantly improved the ability of institutional management support, infrastructure, organizational learning culture and ICT competency to predict implementation of e-learning. Thus, the model was significant. The regression model as a whole was useful in explaining the ability of institutional management support, infrastructure, organizational learning culture and ICT competency to predict the implementation of e-learning.

4.7.5.1 Regression Coefficients of Factors Influence implementation of e-learning in TVET institutions

Results of the regression coefficients presented in Table 4.33 show that the estimates of β values give an individual contribution of a predictor to the model.

Table 4.33: Regression Coefficients factors influencing implementation of e-learning

Model		Unstandardized Coefficients		Standardized Coefficients		Sig
		B	Std. Error	Beta	T	
1	(Constant)	.791	.192		4.114	.000
	Institutional management Support	.243	.082	.286	2.947	.004
	Infrastructure	.300	.105	.403	2.859	.005
	ICT competency	.529	.077	.778	6.860	.000
	Organizational Learning Culture	.311	.055	.352	5.690	.000

Dependent Variables: Implementation of e-learning

The β value tells us about the relationship between Implementation of e-learning with the predictors. The positive β value indicates a positive relationship between the predictors and the outcome. The β values for predictors of implementation of e-learning were positive as indicated in the model. The positive β values indicate the direction of relationship between predictor and outcome. From the results (Table 4.27) the model was then specified as: -

$$\mathbf{y= \beta_0 +\beta_1 X_1+ \beta_2 X_2+ \beta_3 X_3 + \beta_4 X_4+ \varepsilon}$$ **……Equation 4.1**

Implementation of e-learning =.791 +.243 Institutional management Support +.300 Infrastructure +.529 ICT competency.311 Organizational Learning Culture + ε

The T-test was used to identify whether the predictor was making a significant contribution to the model. When the t-test associated with ® value is significant then the predictor is making a significant contribution to the model. Result reveals standardized regression coefficient for

institutional management (®=0.243), This implies that holding other variables in the model constant an increase of 1 standard deviation in institutional managements likely to result in 0.243 standard deviations increase in Implementation of e-learning. Result reveals standardized regression coefficients for infrastructure (®=0. 300), This implies that holding other variables in the model constant an increase of 1 standard deviation in infrastructure is likely to result in 0. 300 infrastructure standard deviations increase in Implementation of e-learning. Result reveals standardized regression coefficient for ICT competency (®=0.529), this implies that holding other variables in the model constant an increase of 1 standard deviation in ICT competency is likely to result in 0. 529 standard deviations increase in Implementation of e-learning. Result reveals standardized regression coefficient for Organizational Learning Culture (®=0 .311), this implies that holding other variables in the model constant an increase of 1 standard deviation in Organizational Learning Culture is likely to result in 0. 311 standard deviations increase in Implementation of e-learning.

The results show that institutional management support (t =2.497, P<.05), infrastructure (t =2.589, P<.05), ICT competency (t =6.860, P<.05) and Organizational Learning Culture is (t =5.690, P<.05). In this regard the research question was answered that institutional management support, infrastructure, ICT competency, Organizational Learning Culture significantly influence the implementation of e-learning in TVET institutions in Uasin Gishu County.

From the findings ICT competency was the greatest contributor to the implementation of e-learning in teaching electrical and electronics engineering. Thus, the trainers and trainees' technical competencies and experience of working with computers is cardinal. The competency should be supported by the people's ability to direct their own training through appropriate knowledge, skills, attitudes, and habits of good conduct (Hosseini, Salimifard &

Yadollahi, 2017). However, this doesn't devalue the roles of institutional management support, infrastructure and Organizational Learning Culture in enhancing the implementation of e-learning in teaching electrical and electronics engineering. In this regard the TVET institutions should bundle all the factors which were under study using a policy framework to enhance their synergy in their implementation of e-learning in the teaching of electrical and electronic engineering. This argumentation is anchored on the Rogers' Theory of Diffusion of Innovation theory which underscores that in an educational process and instructional design, new technology should be employed in an effective way with a meaningful pedagogical role rather than just content's transmitter (Jwaifell & Gasaymeh, 2013). This implies that the adoption of technology by TVET institutions would be optimal and enhanced if it would positively impact teaching.

4.8 Chapter Summary

In this chapter data analysis, results, findings and discussion was presented. There was a response rate of 92.6% which is within the acceptable range for external validity. The coefficient of reliability of the questionnaires was higher than the minimum acceptable value of alpha which should be at least 0.70 or above. Demographic data on Age of respondents, gender, highest level of education and work experience information gives information about the respondents and it is important for the determination of whether the research participants form a representative sample of the target population for the purpose of deriving generalizations. The study used descriptive statistics such as, skewness, kurtosis, variables means and standard deviations to provide a general picture of how the trainers perceived. The factors affecting the implementation of e-learning in TVET institutions in Uasin Gishu County. From the trainers and HODs perspectives all the factors under study as institutional management support (41.8%), infrastructure (44.9%), ICT competence (62.3%) and

organizational learning culture (42%) were influencing implementation of e-learning. Besides the study used simple and multiple regression analysis after testing for its assumptions and Pearson's correlation and established that all the factors namely institutional management support, infrastructure, ICT competence and organizational learning culture had a significant and positive effect on implementation of e-learning in TVET institutions as premised on Diffusion of Innovation (DOI) Theory. However, ICT competence had the greatest effect but this doesn't devalue the role of organizational learning culture, institutional management support and infrastructure.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents conclusions and recommendations derived from research on factors influencing implementation of e-learning in TVET institutions in Uasin Gishu County. The study concluded that implementation of e-learning is significantly influenced by institutional management support, infrastructure, ICT competence, organizational learning culture and in TVET institutions. When combined, all factors under study had a significant positive influence on implementation of e-learning in TVET institutions compared to a single factor.

5.2 Summary of Findings

The main goal of this research was to determine factors that influence implementation of e-learning in TVET institutions in Uasin Gishu County. The study sought to assess the extent to which infrastructure, ICT competence, organizational learning culture, and institutional management support has influenced the implementation of e-learning in TVET institutions.

5.2.1 Influence of institutional management support on implementation of e-learning in TVET institutions

The institutional management remains key in the provision of resources and attenuation of other barriers to implementing and sustaining the technology initiatives. These altogether influence the implementation of e-learning in teaching electrical and electrical engineering. This argument is corroborated by the findings of this study that institutional management support significantly influences the implementation of e-learning in teaching electrical and electrical engineering. Thus, the study concludes that institutional management support has a

positive and significant effect on implementation of e-learning in teaching electrical and electrical engineering. The findings are based on the diffusion of Innovation theory because adoption of technology for e-learning by TVET institutions would be optimal and enhanced through institutional management support to positively impact on teaching electrical and electronic engineering. However, from the descriptive analysis TVET institutions offering electrical engineering in Uasin Gishu County decry lapses in financial allocation for e-learning activities and delayed budgetary approval for undertaking e-oriented electrical and electronic engineering which is a prerogative of the top management.

5.2.2 Influence of infrastructure on implementation of e-learning in TVET institutions

Infrastructure (connectivity, sources of energy and e-equipment) have a significant influence on readiness to adopt e-learning (Mulwa & Kyalo, 2011). This argument is justified by the findings of this study that infrastructure significantly influences the implementation of e-learning in teaching electrical and electrical engineering. Thus, the study concludes that infrastructure has a positive and significant effect on implementation of e-learning in teaching electrical and electrical engineering. The findings are based on the diffusion of Innovation theory because adoption of technology for e-learning by TVET institutions would be optimal and enhanced through infrastructure to positively impact on teaching electrical and electronic engineering. However, from descriptive analysis the respondents were undecided on the goodness of the bandwidth to help users' access e-Learning courses seamlessly and performance of servers for learning. This calls for improvement of the adequacy of infrastructure for effective implementation of e-learning in electrical and electronic engineering.

5.2.3 Influence of ICT competence on implementation of e-learning in TVET institutions

ICT in teaching and learning is an innovative approach to the use of new technologies in equipping trainees with knowledge, skills and attitudes needed in many engineering fields (Daniel, 2021). This is justified by the findings of this study that ICT competence significantly influences the implementation of e-learning in teaching electrical and electrical engineering. Thus, the study concludes that ICT competence has a positive and significant influence on implementation of e-learning in teaching electrical and electrical engineering. This argument hinged on the diffusion of Innovation theory because adoption of technology for e-learning by TVET institutions in teaching electrical and electronic engineering would be enhanced through ICT competence of both the trainers and trainees. Therefore, the TVET institutions should ensure that all the electrical and electronics engineering trainers and students are equipped with the adequate knowledge and skills to manipulate both the electrical and electronic engineering ICT software and hardware for effective implementation of e-learning.

5.2.4 Influence of organizational learning culture on implementation of e-learning

Organizational learning culture focuses on the creation of knowledge and the use of that knowledge within an organization (Khan et al, 2021). In this regard organizational learning culture in TVET institutions remains key in effective implementation of e-learning in TVET institutions for effective training of electronic and electrical engineering. This is justified by the findings of this study that organizational learning culture significantly influences the implementation of e-learning in teaching electrical and electrical engineering. Thus, the study concludes that organizational learning culture has a positive and significant influence on implementation of e-learning in teaching electrical and electrical engineering. From the

descriptive there was poor promotion of knowledge sharing by leadership of TVET, low encouragement of trainers and trainees' ability for innovation and committed to learning and allocation of resources to employees learning. This calls for a need for instituting a potent organizational learning culture for effective implementation of e-learning.

5.2.5 Factors that influence implementation of e-learning in TVET institutions

The study has highlighted the factors influencing e-learning implementation for purposes of strengthening the teaching of electrical and electronic engineering. This espoused the fact that academicians and employees should get informed that e-learning is not only about using technology but more about delivering improved and effective teaching and learning (Noh et al., 2012). This is pegged on addressing the factors that influence e-learning in teaching electronics and electrical engineering. From the findings ICT competency was the greatest contributor to the implementation of e-learning in teaching electrical and electronics engineering. Thus, the trainers and trainees' technical competencies and experience of working with computers is cardinal. The competency should be supported by the people's ability to direct their own training through appropriate knowledge, skills, attitudes, and habits of good conduct (Hosseini, Salimifard & Yadollahi, 2017).

However, this doesn't devalue the roles of institutional management support, infrastructure and Organizational Learning Culture in enhancing the implementation of e-learning in teaching electrical and electronics engineering. In this regard the TVET institutions should bundle all the factors which were under study using a policy framework to enhance their synergy in their implementation of e-learning in the teaching of electrical and electronic engineering. This argumentation is anchored on the Rogers' Theory of Diffusion of Innovation theory which underscores that in an educational process and instructional design, new technology should be employed in an effective way with a meaningful pedagogical role

rather than just content's transmitter (Jwaifell & Gasaymeh, 2013). This implies that the adoption of technology by TVET institutions would be optimal and enhanced if it would positively impact teaching.

5.3 Conclusion

The institutional management remains key in the provision of resources and attenuation of other barriers to implementing and sustaining the technology initiatives. Institutional management support has a positive and significant effect on implementation of e-learning in teaching electrical and electrical engineering. Infrastructure has a positive and significant influence on implementation of e-learning in teaching electrical and electrical engineering. ICT competence amongst the trainees and trainers remains key in organizing workload, streamline processes and access digital information for effective implementation of e-learning in TVET institutions. Organizational learning culture has a positive and significant influence on implementation of e-learning in teaching electrical and electrical engineering. Therefore, organizational learning culture in TVET institutions remains key in effective implementation of e-learning in TVET institutions for effective training of electronic and electrical engineering.

Results from the study showed that combining all the four factors which were understudy namely; ICT competence, institutional management support, infrastructure and Organizational Learning Culture had the highest positive influence on implementation of e-learning in teaching electrical and electronics engineering in TVET institutions. Based on the unstandardized coefficients ICT competence was the greatest contributor to implementation of e-learning in teaching electrical and electronics engineering in TVET institutions followed by Organizational Learning Culture, Infrastructure and Institutional management support respectively. This implies that individual factors have different strengths in their influence on

implementation of e-learning in electrical and electronics engineering. Therefore, the TVET institutions should synergistically bundle all the factors studied as they improve on them in order to secure maximal implementation of e-learning.

5.4 Recommendations

In view of the findings of the study and the guidance from the literature review, it is apparent that strengthening top management support, infrastructure, ICT competence and organizational learning culture improves the implementation of e-learning in TVET. Therefore, the study makes the following recommendations:

1. The institutional management should ensure that there is adequate financial allocation for e-learning activities and on time budgetary approval for undertaking re-oriented electrical and electronic engineering teaching and learning. Finally,

2. The institutional management should formulate and implement policies that provides a facilitating environment for e-learning.

3. There is need for provision of high-capacity bandwidth to sufficiently cater for the students and trainers to access e-Learning courses seamlessly.

4. The institutions should improve on their e-learning software and hardware requirements in terms of relevance and adequacy for effective implementation of e-learning in electrical and electronic engineering.

5. TVET institutions should ensure that all trainers and students are equipped with the adequate knowledge and skills to manipulate both the ICT software and hardware for effective implementation of e-learning.

6. TVET leadership should promote knowledge sharing by capturing the trainers knowledge and encourage trainers and trainees' ability for innovation and commitment to e- learning.

5.5 Suggestions for Further Research

The study focused on four factors influencing implementation of e-learning in TVET institutions in Uasin Gishu County. There is a need to expand the scope of the study to include several other factors as well as exhaustively look at all the factors influencing implementation of e-learning in TVET institutions in other countries.

5.6 Chapter Summary

This chapter has presented conclusions and recommendations on findings of factors influencing implementation of e-learning in TVET institutions in Uasin Gishu County. Collectively all the factors namely; infrastructure, ICT competence, organizational learning culture, and institutional management support had a positive significant influence on the implementation of e-learning in TVET institutions. ICT competence was the greatest contributor to implementation of e-learning in teaching electrical and electronics engineering in TVET institutions followed by Organizational Learning Culture, Infrastructure and Institutional management support respectively. This implies that individual factors have different strengths in their influence on implementation of e-learning in electrical and electronics engineering. Therefore, the TVET institutions should synergistically bundle all the factors studied as they improve on them in order to secure maximal implementation of e-learning. There is a need to expand the scope of the study to include several other factors as well as exhaustively look at all the factors influencing implementation of e-learning in TVET institutions in other countries.

REFERENCES

Ajoke, A. R. (2017). The importance of instructional materials in teaching English as a second language. *International Journal of Humanities and Social Science Invention*, *6*(9), 36-44.

Al-araibi, A. A., Mahrin, M. N., & Yusoff, R. C. (2019). Technological aspect factors of E-learning readiness in higher education institutions: Delphi technique. *Education and Information Technologies, 24*, 567-590.

Alexandra, G. (2014). Is qualitative research generalizable? *Journal of community positive practices, XIV* (3), 114-124.

Ali, W. (2020). Online and remote learning in higher education institutes: A necessity in light of COVID-19 pandemic. *Higher education studies*, *10*(3), 16-25.

Allen, M. W. (2016). *Michael Allen's guide to e-learning: Building interactive, fun, and effective learning programs for any company*. John Wiley & Sons.

Almaiah, M. A., & Almulhem, A. (2018). A conceptual framework for determining the success factors of e-learning system implementation using Delphi technique. *Journal of Theoretical and Applied Information Technology*, *96*(17), 5962-5976.

Amaniclubs. (2020). *Bungoma county*. www.cohesion.or.ke

Amini, C. M., & Oluyide, O. P. (2020). Analysis of ICT competencies among distance learning students in selected study centers of the National Open University of Nigeria. *Journal of Learning for Development*, *7*(1), 78-89.

Angeline, S. (2012). *The Influence of ICT Infrastructure on Readiness to Adopt E-Learning In Secondary Schools In Kitui District, Kenya.* University of Nairobi.

Bailey, D., Almusharraf, N., & Hatcher, R. (2021). Finding satisfaction: Intrinsic motivation for synchronous and asynchronous communication in the online language learning context. *Education and Information Technologies*, *26*, 2563-2583.

Banday, M. T., Ahmed, M., & Jan, T. R. (2014). Applications of e-Learning in engineering education: A case study. *Procedia-Social and Behavioral Sciences, 123*, 406-413.

Bariu, T., Xiong, C., & Azzeddine, B. (2022). Influence of Teachers' Competencies on ICT Implementation in Kenyan Universities. *Education Research International*, Volume 2022.

Bastola, P., Ameenb, A., & Isaacc, O. (2019). The Effect of E-Learning Actual Use on the Net Benefit among Public Universities Students in Nepal. *In 22nd International Conference on IT Applications and Management (ITAM)*, 158-164.

Benaquisto, L., & Babbie, E. (2002). *Fundamentals of social research.* Scarborough: ON: Nelson Thomson Learning.

Bolliger, D. U., & Martin, F. (2018). Instructor and student perceptions of online student engagement strategies. *Distance Education*, *39*(4), 568-583.

Brysbaert, M. (2019). How many participants do we have to include in properly powered experiments? A tutorial of power analysis with reference tables. *Journal of Cognition*, *2*(1).

Burns, M. (2014). *The Bandwidth Schools Have and the Bandwidth They Need*. https://elearningindustry.com

Carfagna, E., & Arti, V. B. (2007). Crop area estimates with area frames in the presence of measurement errors. *Proceedings of ICAS-IV, Fourth International Conference on Agricultural Statistics. Invited paper*, (22-24). Beijing.

Celik, I., Sahin, I., & Aydin, M. (2014). Reliability and Validity Study of the Mobile Learning Adoption Scale Developed Based on the Diffusion of Innovations Theory. Online Submission, *2*(4), 300-316.

Chen, J. (2023). *Normal Distribution: What It Is, Properties, Uses, and Formula.* https://www.investopedia.com

Cheruiyot, D. (2022). *The role of technical and vocational education training on entrepreneurial development in South Rift region, Kenya*. University of Kabianga.

Chuang, C. H., Jackson, S. E., & Jiang, Y. (2016). Can knowledge-intensive teamwork be managed? Examining the roles of HRM systems, leadership, and tacit knowledge. *Journal of management*, *42*(2), 524-554.

CIDP. (2018). *County Integrated Development Plan 2018-2022, Bungoma. Bungoma: County Government of Bungoma; 2018.*

Clark, R. C., & Mayer, R. E. (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning*. John Wiley & sons.

Collis, J., & Hussey, R. (2009). Business Research: A practical guide for undergraduate and post-graduate students. 3rd edition, Palgrave Macmillan Construction Industry. *Engineering, Construction and Architectural Management*, *10*(5), 333-342.

Collis, J., & Hussey, R. (2014). Business Research. sl.

Cooper, C. R., & Schindler, P. S. (2014). *Business research methods (10 ed.).* Boston: McGraw-Hill.

Daniel, M. C. (2021). Deployment of Information Communication Technology for Teaching and Learning Engineering Technological Skills: A Case of National Polytechnics in Kenya *European Journal of Education and Pedagogy*, *2*(3), 8-12.

Darby, F. (2020). The Learner-centered Instructional Designer: Purposes, Processes, and Practicalities of Creating Online Courses in Higher Education. *Stylus Publishing, LLC*.

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied developmental science*, *24*(2), 97-140.

Deepika, V., Soundariya, K., Karthikeyan, K., & Kalaiselvan, G. (2021). 'Learning from home': role of e-learning methodologies and tools during novel coronavirus pandemic outbreak. *Postgraduate Medical Journal*, *97*(1151), 590-597.

DeWitt, P., & Slade, S. (2014). *School Climate Change*: How do I build a positive environment for learning (ASCD Arias). ASCD.

Dial, J. C. (2008). *The effect of teacher experience and teacher degree levels on student achievement in mathematics and communication arts*. Doctoral dissertation, Baker University.

Dikko, M. (2016). Establishing Construct Validity and Reliability: Pilot Testing of a Qualitative Interview for Research in Takaful (Islamic Insurance). *Qualitative Report*, *21*(3), 12-35.

Dillman, D. A. (2011). *Mail and Internet surveys: The tailored design method--2007 Update with new Internet, visual, and mixed-mode guide.* John Wiley & Sons.

Dumbiri, D. N., & Nwadiani, C. O. (2020). Challenges Facing Application of E-learning Facilities in Vocational and Technical Education Program in South Nigeria Universities. *Asian Journal of Vocational Education and Humanities*, *1*(2), 1-8.

Elliott, R., & Clayton, J. (2009). Critical success factors in e-learning for large enterprises.Paper presented at the ALT-C, Manchester, England.

Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2014). Qualitative content analysis: A focus on trustworthiness. *SAGE open*, *4*(1), 2158244014522633.

Garad, A., Al-Ansi, A. M., & Qamari, I. N. (2021). The role of e-learning infrastructure and cognitive competence in distance learning effectiveness during the covid-19 pandemic. *Jurnal Cakrawala Pendidikan*, *40*(1), 81-91.

García-Avilés, J. A. (2020). Diffusion of Innovation. *The International Encyclopedia of Media Psychology*, 1-8.

Ginker, T., & Lieberman, O. (2017). Robustness of binary choice models to conditional heteroscedasticity. *Economics Letters*, *150*, 130-134.

Glonti, V., Trynchuk, V., Khovrak, I., Mokhonko, G., Shkrobot, M., & Manvelidze, L. (2020). Socialization of organization sustainable development based on the principles of corporate social responsibility. *Montenegrin Journal of Economics*, *16*(1), 169-182.

Guenaneche, H., & Radigales, F. (2008). *E-learning platforms: Moodle and Dokeos.* University of Madrid, Spain. Retrieved from Retrieved from http://www.it.uc3m.es on 27/06/2022

Gul, S. B. (2015). *E-Learning Revolutionise Education: An Exploratory Study*.

Haleman, K. N., & Yamat, H. (2021). The Acceptance of E-Learning Among ESL Primary School Students During Covid-19. *Journal of English Language Teaching and Applied Linguistics*, *3*(1), 08-18.

Hardy, B., & Castonguay, J. (2018). “The moderating role of age in the relationship between social media use and mental well-being: an analysis of the 2016 general social survey”, *Computers in Human Behavior*, *85*, 282-290.

Hashim, M. H. (2015). Using Technology and Instructional E-Material among Technical Teacher and Student into Teaching and Learning: A Qualitative Case Study.*International Education Studies*, *8*(3), 175-180.

Heale, R., & Twycross, A. (2015). Validity and reliability in quantitative studies. *Evidence-based nursing*, *18*(3), 66-67.

Hodges, C. B., Moore, S., Lockee, B. B., Trust, T., & Bond, M. A. (2020). *The difference between emergency remote teaching and online learning.*

Hoq, M. Z. (2020). E-Learning during the period of pandemic (COVID-19) in the kingdom of Saudi Arabia: an empirical study. *American Journal of Educational Research*, *8*(7), 457-464.

Horrigan, J. B. (2016). Lifelong learning and technology. *Research Center*, Pew.

Hosseini, S. Y., Salimifard, K., & Yadollahi, S. (2017). *E-learning readiness and the effects of organizational culture. In Organizational Culture and Behavior: Concepts, Methodologies, Tools, and Applications (1299-1313).* IGI Global.

https:// www.bungoma.go.ke/download/cidp/.

https://vtechworks.lib.vt.edu.

Hwang, G. J., & Tsai, C. C. (2011). Research trends in mobile and ubiquitous learning: A review of publications in selected journals from 2001 to 2010. *British Journal of Educational Technology*, *42*(4), E65-E70.

Jammalamadaka, S. R., Taufer, E., & Terdik, G. H. (2021). On multivariate skewness and kurtosis. *Sankhya A*, *83*(2), 607-644.

Jordan, S. G., Robbins, J. B., Sarkany, D., England, E., Kalia, V., Patel, M. D., & Heitkamp, D. E. (2019). The Association of Program Directors in radiology well-being 2019 survey: identifying residency gaps and offering solutions. *Journal of the American College of Radiology*, *16*(12), 1702-1706.

Jorge, G. R., Michael, J. M., & Rosanne, L. (2006). The Impact of E-Learning in Medical Education. *Publication in Academic Medicine*, *81*, 3/2006.

Jwaifell, M., & Gasaymeh, A. M. (2013). Using the Diffusion of Innovation Theory to Explain the Degree of English Teachers' Adoption of Interactive Whiteboards in the Modern Systems School in Jordan: A Case Study. *Contemporary educational technology*, *4*(2), 138-149.

Kaimenyi, C. K. (2013). An analysis of affirmative action: the two-thirds gender rule in Kenya. *International Journal of Business, Humanities and Technology, 3(6), 91-97.*

Karmakar, C. K. (2000). *Recommendations for Bangladesh towards e-learning readiness*. Department of computer science, ShahJalal University of science and technology.

Keramati, A., Afshari-Mofrad, M., & Kamrani, A. (2011). The role of readiness factors in E-learning outcomes: An empirical study. *Computers & Education*, *57*(3), 1919-1929.

Keramati, A., Afshari-Mofrad, M., Amir-Ashayeri, D., & Nili, A. (2011). The intervening role of infrastructures in e-learning performance. In the International Conference on Digital Enterprise and Information Systems (646-652). *Springer, Berlin*.

Kervin, L., Verenikina, I., Wrona, K., & Jones, P. T. (2010). Interactive whiteboards: Interactivity, activity and literacy teaching. *In J. Herrington & B. Hunter (Eds.), Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecomm*.

Khan, M. S., Saengon, P., Charoenpoom, S., Soonthornpipit, H., & Chongcharoen, D. (2021). The impact of organizational learning culture, workforce diversity and knowledge management on innovation and organization performance: A structural equation modeling approach. *Human Systems Management*, *40*(1), 103-115.

Khan, S., Hasan, M., & Clement, C. (2012). Barriers to the introduction of ICT into education in developing countries: The example of Bangladesh. *International Journal of Instruction*, *5*(2), 61-80.

Khurramovich, K. F. (2023). Developing a set of wellness exercises for middle aged men (45-60 years old) according to physical preparation. *Best Journal of Innovation in Science, Research and Development, 2(6), 361-365.*

Kibuku, R. N., Ochieng, D. O., & Wausi, A. N. (2020). E-Learning Challenges Faced by Universities in Kenya: A Literature Review. *Electronic Journal of e-Learning*, 18(2), 150-161.

Kiget, N. K., Wanyembi, G., & Peters, A. I. (2014). Evaluating usability of e-learning systems in universities. *International Journal of Advanced Computer Science and Applications*, *5*(8), 12-36.

Kim, T. K. (2017). Understanding one-way ANOVA using conceptual figures. *Korean journal of anesthesiology*, *70*(1), 22-26.

KNBS. (2015). *Kenya demographic and health survey 2014 [internet]. Nairobi: Kenya National Bureau of Statistics; 2015.* https://dhsprogram.com.

Kopaiboon, W., Reungtrakul, A., & Wongwanich, S. (2014). Developing the quality of ICT competency instruments for lower secondary school students. *Procedia-Social and Behavioral Sciences*, *116*, 1802-1809.

Kuskaya, M. F., & Kocak, U. (2010). ICT in Vocational and Technical Schools: Teachers' Instructional, Managerial and Personal Use Matters. *Turkish Online Journal of Educational Technology-TOJET*, *9*(1), 98-106.

Latchem, C. (2017). Using ICTs and Blended Learning in Transforming TVET. Perspectives on Open and Distance Learning. *Commonwealth of Learning*.

Liang, J., Tang, M. L., & Zhao, X. (2019). Testing high-dimensional normality based on classical skewness and Kurtosis with a possible small sample size. *Communications in Statistics-Theory and Methods*, *48*(23), 5719-5732.

Lin, C. Y., Huang, C. K., & Zhang, H. (2019). Enhancing employee job satisfaction via E-learning: the mediating role of an organizational learning culture. *International Journal of Human–Computer Interaction*, *35*(7), 584-595.

Liu, Y. C., Huang, Y. A., & Lin, C. (2012). Organizational factors' effects on the success of e-learning systems and organizational benefits: An empirical study in Taiwan. *The International Review of Research in Open and Distributed Learning*, *13*(4), 130-151.

Lu, X., Zhao, X., & Han, H. (n.d.). Analysis on factors impacting information system development. In 2008 International Seminar on Future Information Technology and Management Engineering (356-359*). IEEE. 2008*.

Lucas, R. E., & Brent, D. M. (2012). Estimating the reliability of single-item life satisfaction measures: Results from four national panel studies. *Social Indicators Research*, *105*(3), 323-331.

Macgregor, G., & Turner, J. (2009). Revisiting e-learning effectiveness: proposing a conceptual model. *Interactive Technology and Smart Education*.

Mardiah, H. (2020). The use of e-learning to teach English in the time of the Covid-19 pandemic. *English Teaching and Linguistics Journal (ETLiJ)*, *1*(2), 45-55.

McKnight, K., O'Malley, K., Ruzic, R., Horsley, M. K., Franey, J. J., & Bassett, K. (2016). Teaching in a digital age: How educators use technology to improve student learning. *Journal of research on technology in education*, *48*(3), 194-211.

Miller, R. L. (2015). Rogers' innovation diffusion theory (1962, 1995). In Information seeking behavior and technology adoption: Theories and trends (261-274). *IGI Global.*

Mugenda, O. M., & Mugenda, A. G. (2012). *Research methods dictionary*.

Mulwa, A. S., & Kyalo, D. N. (2011). *The influence of ICT infrastructure on readiness to adopt e-learning in secondary schools in Kitui district, Kenya*. Lecturer, University of Nairobi.

Munyi, F. W., Okinda, R., & Wambua, F. (2021). E-learning Adoption Model in TVET Institutions in Kenya During and Post COVID–19. *International Journal of Applied Computer Science (IJACS)*, *6*(4), 1-10.

Murithi, J., & Yoo, J. E. (2021). Teachers' use of ICT in implementing the competency-based curriculum in Kenyan public primary schools. *Innovation and Education*, *3*(1), 1-11.

Murray, M. (1990). Theorizing Patriarchy.

Mutisya, D. N., & Makokha, G. L. (2016). Challenges affecting adoption of e-learning in public universities in Kenya. *E-Learning and Digital Media*, *13*(3-4), 140-157.

Mwangi, E. (2017). *ICT Infrastructure Preparedness for E-Learning Implementation in Kenyan Universities*. Retrieved from Retrieved from library.kisiiuniversity.ac.ke on 27/06/2022

Mwenisongole, C. (2021). *Information Communication Technology through Technical Vocational Education and Training: Experiences from Arusha Tanzania.* Doctoral dissertation, The Open University of Tanzania.

Njeru, G. N., & Mugi, K. (2018). *Skills and Competency Gaps Analysis of Motor Mechanics in the Informal Sector: A Case Study for Meru Township in Kenya.*

Noh, N. M., Isa, P. M., Samah, S. A., Noh, N. M., & Isa, M. A. (2012). Establishing an Organizational e-learning Culture to Motivate Lecturers to Engage in e-Learning in UiTM. *Procedia-Social and Behavioral Sciences*, *67*, 436-443.

Nyante, S. J., Biritwum, R., Figueroa, J., Graubard, B., Awuah, B., Addai, B. W., & Brinton, L. A. (2019). Recruiting population controls for case-control studies in sub-Saharan Africa: The Ghana Breast Health Study. *PloS one*, *14*(4), e0215347.

Nyaundi, L. (2020). *Why online learning is hard to implement in technical colleges.* https://www.the-star.co.ke.

Nyerere, J. A., Gravenir, F. Q., & Mse, G. S. (2012). Delivery of Open Distance and e-Learning in Kenya. *The International Review of Research in Open and Distance Learning, [e-journal]*, *13*(3), 185-202.

Nyongesa, L. C., Mabele, S. A., & Murunga, G. (2022). An investigation into the effectiveness of e-learning in Technical and Vocational Education and Training (TVET) Institutions in Western Kenya. *The Kenya Journal of Technical and Vocational Education and Training, V*.

Obwoge, M. E., & Kwamboka, O. S. (2016). E-Learning in TVET: An Opportunity for Developing Countries. *IRA International Journal of Education and Multidisciplinary Studies*, *3*(3), 347-352.

Ocholla, I. A., Agutu, N. O., Ouma, P. O., Gatungu, D., Makokha, F. O., & Gitaka, J. (2020). Geographical accessibility in assessing bypassing behavior for inpatient neonatal care, Bungoma County-Kenya. *BMC Pregnancy and Childbirth*, 20, 1-16.

Okumu, G. J., & Kenei, J. K. (2022). The Efficacy of Distance and On-line Learning in TVET Institutions in Kenya. *The Kenya Journal of Technical and Vocational Education and Training*, *5*, 17-31.

Orchard, C. A., King, G. A., Khalili, H., & Bezzina, M. B. (2012). Assessment of Interprofessional Team Collaboration Scale (AITCS): development and testing of the instrument. *Journal of continuing education in the health professions*, *32*(1), 58-67.

Owuor, D. L., Kogeda, P. O., Anele, A. O., & Osuri, S. O. (2013). Factors affecting E-learning implementation in Southern Africa. *In 2013 Africon (pp. 1-5). IEEE.*

Patel, N. M., Kadyamatimba, A., & Madzvamuse, S. (2017). *Research Article Investigating Factors Influencing the Implementation of e-learning at Rural Based Universities.*

Patnaik, J., & Bhowmick, B. (2020). Promise of inclusive innovation: A Re-look into the opportunities at the grassroots. *Journal of Cleaner Production*, *259*, 121124.

Petrina, S. (2006). *Advanced teaching methods for the technology classroom*. IGI Global.

Picciano, A. G., Seaman, J., Shea, P., & Swan, K. (2012). Examining the extent and nature of online learning in American K-12 education: The research initiatives of the Alfred P. Sloan Foundation. *The internet and higher education*, *15*(2), 127-135.

Polgar, S., & Thomas, S. A. (2011). Introduction to Research in the Health Sciences EBook. .*Elsevier Health Sciences.*

Qu, Y. Y., Cong, H., & Hao, T. (2017). Pedagogical principle-based e-learning exploration: a case of construction mediation training. In the International Symposium on Emerging Technologies for Education (539-547). *Springer, Cham*.

Raghunathan, T. S., & King, W. R. (1988). The impact of information systems planning on the organization. *Omega*, *16*(2), 85-93.

Rajput, A. G. (2019). Training manual on instructional design for e-learning courses. *Manila, Philippines: Colombo Plan Staff College.*

Raykov, T., & Marcoulides, G. A. (2019). Thanks coefficient alpha, we still need you. *Educational and psychological measurement*, *79*(1), 200-210.

Reich, J., Buttimer, C. J., Fang, A., Hillaire, G., Hirsch, K., Larke, L. R., & Slama, R. (2020). Remote learning guidance from state education agencies during the COVID-19 pandemic: A first look. *Massachusetts Institute of Technology*.

Rodrigues, H., Almeida, F., Figueiredo, V., & Lopes, S. L. (2019). Tracking e-learning through published papers: A systematic review. *Computers & Education*, *136*(3), 87-98.

Roszak, M., & Kolodziejczak, B. (2017). Teachers' Skills and ICT Competencies in Blended Learning. *https://www.semanticscholar.org*.

Rytkønen, M., & Rasmussen, P. (2010). E-learning capacity at the East African STRAPA universities. Copenhagen. *University of Copenhagen/Faculty of Life Sciences (UC/LIFE), Denmark.*

Salamatina, Y. (2020). The use of e-learning resources in distance learning. *https://iopscience.iop.org*, *1691* (2020) 012189.

Salmela, S., Eriksson, K., & Fagerström, L. (2012). Leading change: a three-dimensional model of nurse leaders' main tasks and roles during a change process. *Journal of advanced nursing*, *68*(2), 423-433.

Sandybayev, A. (2020). The impact of e-learning technologies on student's motivation: Student centered interaction in business education. *International Journal of Research in Tourism and Hospitality (IJRTH), 6*(1), 16-24.

Singh, A. S. (2017). Common procedures for development, validity and reliability of a questionnaire. *International Journal of Economics, Commerce and Management, 5*(5), 790-801.

Singh, J., Steele, K., & Singh, L. (2021). Combining the best of online and face-to-face learning: Hybrid and blended learning approach for COVID-19, post vaccine, & post-pandemic world. *Journal of Educational Technology Systems, 50*(2), 140-171.

Sonatha, Y., & Azmi, M. (2020). *The Influence of Organizational Culture on E-Learning Readiness. Proceedings of the 2nd Workshop on Multidisciplinary and Applications (WMA) 2018, 24-25 January 2018*, Padang, Indonesia.

Sri, K. U., & Krishna, T. V. (2014). E-Learning: Technological Development in Teaching for school kids. *International Journal of Computer Science and Information Technologies, 5*(5), 6124-6126.

Sun, P. C., Tsai, R. J., Finger, G., Chen, Y. Y., & Yeh, D. (2008). What drives successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & education, 50*(4), 1183-1202.

Swaen, B. (2020). *Conceptual framework*. Retrieved from www.scribbr.com retrieved on 26/12/2020

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education, 48*(6), 1273-1296.

Taherdoost, H. (2016). Validity and reliability of the research instrument; how to test the validation of a questionnaire/survey in research. How to test the validation of a questionnaire/survey in research (August 10, 2016).

Tamayo-Torres, J., Gutierrez-Gutierrez, L., & Ruiz-Moreno, A. (2014). The relationship between exploration and exploitation strategies, manufacturing flexibility and organizational learning: An empirical comparison between Non-ISO and ISO certified firms.

Tamura, R., Kobayashi, K., Takano, Y., Miyashiro, R., Nakata, K., & Matsui, T. (2017). Best subset selection for eliminating multicollinearity. *Journal of the Operations Research Society of Japan, 60*(3), 321-336.

Tarus, J. K., & Gichoya, D. (2015). E-Learning in Kenyan Universities: Preconditions for Successful Implementation. *The Electronic Journal of Information Systems in Developing Countries, 66*(1), 1-14.

Tarus, J. K., Gichoya, D., & Muumbo, A. (2015). "Challenges of implementing e-learning in Kenya: A case of Kenyan public universities. *The International Review of Research in Open and Distributed Learning, 16*(1), 45-58.

Turkyilmaz, I., Hariri, N. H., & Jahangiri, L. (2019). Student's perception of the impact of e-learning on dental education. *J Contemp Dent Pract*, *20*(5), 616-621.

Ullah, M. I., Aslam, M., Altaf, S., & Ahmed, M. (2019). Some new diagnostics of multicollinearity in linear regression models. *Sains Malaysiana*, *48*(9), 2051-2060.

UNESCO. (2022). *Digital skills development in TVET teacher training.* Retrieved from https://unevoc.unesco.org

Van der Waldt, G. (2020). Constructing conceptual frameworks in social science research. TD. *The Journal for Transdisciplinary Research in Southern Africa*, *16*(1), 1-9.

Vasudevan, S. (2016). Role of questionnaires in medical research and patient management. *Kerala Medical Journal*, *9*(1), 1-2.

Verma, J. P., & Abdel-Salam, A. S. (2019). *Testing statistical assumptions in research.* John Wiley & Sons.

Viladrich, C., Angulo-Brunet, A., & Doval, E. (2017). A journey around alpha and omega to estimate internal consistency reliability. *Annals of psychology*, 33(3), 755-782.

villanovau.com. (2018). *What is Ethical Leadership?* Retrieved from www.villanovau.com retrieved on 27/07/2020

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*, *45*(80), 513-521.

Wang, J. F., Stein, A., Gao, B. B., & Ge, Y. (2012). A review of spatial sampling. *Spatial Statistics*, *2*, 1-14.

Wanga, H., Ngumbuke, F., & Oroma, J. O. (2012). Challenges of e-learning in developing countries: The Ugandan experience. *academia.edu*, *12*(12), 2015.

Wise, S. L. (2015). Effort analysis: Individual score validation of achievement test data. . *Applied Measurement in Education*, *28*(3), 237-252.

www.ilo.org. (2021). *Digitalization of national TVET and skills systems: Harnessing technology to support LLL*. https://www.ilo.org

www.kenyacountyguide.co.ke. (2021). *Kenya County Guide*. https://www.kenyacountyguide.co.ke

www.tevta.go.ke. (2019). *TVET Authority Develops Trainers Qualification Framework*. www.tveta.go.ke

Yeap, C. F., Suhaimi, N., & Nasir, M. K. (2021). Issues, challenges, and suggestions for empowering technical vocational education and training education during the COVID-19 Pandemic in Malaysia. *Creative Education*, *12*(8), 1818-1839.

Zhao, N., Xu, Q., Tang, M. L., Jiang, B., Chen, Z., & Wang, H. (2020). High-dimensional variable screening under multicollinearity. *Stat*, *9*(1), e272.

Zyad, H. (2016). Integrating computers in the classroom: Barriers and teachers' attitudes. *International Journal of Instruction, 9*(1), 65–78.

APPENDICES

Appendix I: Introduction Letter

Dear respondent,

I am a master's student at University of Eldoret undertaking a **Master of Education in Technology Education.** I am undertaking research on **"Factors influencing the effective implementation of e-learning in TVET institutions in Uasin Gishu County"**. In this regard you have been identified as one of the respondents for this study. Any information you give will be handled with total confidentiality and at no time will you be required to identify yourself by name. Your participation in this study is dependent on your willingness. I guarantee that this research will be used for purely academic purposes.

In case of any enquiries, please contact **0700296843, faithsisimwo@gmail.com**

Thank you.

Yours faithfully,

Faith Maiba Sisimwo

SEDU/TED/M/018/21

Appendix II: Questionnaire for Trainers

This study focuses on the determination of factors that influence the implementation of e-learning in TVET institutions in Uasin Gishu County. Please note that your responses are confidential and anonymous as you are not required to indicate your name. Kindly answer all questions to the best of your knowledge.

QUESTIONNAIRE NUMBER

Kindly put a tick (√) against the correct choice.

1. Gender

Male [ ] Female [ ]

2. Age bracket

20 -30 years [ ] 31 -40 years [ ]

41 -50 years [ ] 51 -60 years [ ]

3. Highest level of education?

Diploma [ ] Bachelors' [ ]

Post graduate [ ] any other [ ]

4. **For how long have you worked as a trainer?**

Less than 1 year [ ] 11-15 years [ ]

1-5 years [ ] 16-20 years [ ]

6-10 years [ ] Over 20 years [ ]

SECTION B: Instructions

Please indicate the extent to which you agree or disagree with each statement by placing a tick where appropriate using the following 5-Point Likert scale: In Parts **I** and **II**.

5 = Strongly Agree (SA) 4 = Agree (A) 3 = Undecided (UD) 2 = Disagree (D) 1 = Strongly Disagree (SD)

PART I: FACTORS AFFECTING IMPLEMENTATION OF E-LEARNING

This part has parts 1a, b, c and d

PART I a: Institutional Management Support

Please, indicate to what extent you agree with the following statements on institutional management support

Response Item	**1** **Strongly Disagree**	**2** **Disagree**	**3** **Undecided**	**4** **Agree**	**5** **Strongly Agree**
The financial allocation for implementation of e-learning is sufficient					
E- learning Budgets are approved on time					
Relevant and operational e-learning policies are fully supported management					
There is a timely address of management-oriented challenges					
The trainers are adequately motivated to take part in e-learning					
A facilitating environment for e-learning is provided by the management					

PART I b: Infrastructure

Please, indicate to what extent you agree with the following statements on infrastructure

Response Item	**1 Strongly Disagree**	**2 Disagree**	**3 Undecided**	**4 Agree**	**5 Strongly Agree**
E-Learning courses are seamlessly accessed by students because of a good bandwidth					
There is a quick response time in uploading and retrieving content					
Fast processing requests are facilitated by available core processors					
There is high performance feature for learning based on the servers					
The learning Management System platform can be effectively accessed					
Knowledge sharing and interaction is promoted by the available e-learning tools					
Electronic learning equipment provided by the institution are sufficient					
Uninterruptible Power Supply (UPS) is available					

PART I c: ICT Competence

Please, indicate to what extent you agree with the following statements on ICT competence

Response Item	**1** **Strongly Disagree**	**2** **Disagree**	**3** **Undecided**	**4** **Agree**	**5** **Strongly Agree**
I am capable of creating interactive learning platforms for electrical engineering					
I am familiar with ICT tools, and special usage patterns for teaching electrical engineering					
I am competent in educational practices and strategies on ICT application					
The learners have the necessary ICT-related skills for e-learning					
There is an emphasis on the learner's capabilities on ICT Development					
Online course design and online teaching instructional guidance is accessible to academic staff					

PART Id: Organizational Learning Culture

Please, indicate to what extent you agree with the following statements on organizational culture

Response Item	**1** **Strongly Disagree**	**2** **Disagree**	**3** **Undecided**	**4** **Agree**	**5** **Strongly Agree**
Ability for innovation is encouraged by the institution					
There is a commitment to learning and al-location of resources to trainers by the institution					
Leadership promotes knowledge sharing					
There is continuous learning amongst trainers on e-learning					
Knowledge sharing on e-learning is encouraged amongst trainers					

PART II: Implementation of e-learning

Please, indicate to what extent you agree with the following statements on implementation of e-learning

Response Item	**1 Strongly Disagree**	**2 Disagree**	**3 Undecided**	**4 Agree**	**5 Strongly Agree**
Data of electronic teaching materials are used to build most of the lessons					
I always use e-teaching					
Newly acquired knowledge online is effectively applied					
Specific tasks as learnt through e-platforms are performed by learners					
Learners are engaged with the learning material during the learning process					
The platforms are easy to use					

Appendix III: Interview Schedule for Heads of Departments

Dear Respondent:

This study focuses on the determination of factors that influence the implementation of e-learning in TVET institutions in Uasin Gishu County. Please note that your responses are confidential and anonymous as you are not required to indicate your name. Kindly answer all the interview questions to the best of your knowledge.

1. How does the institutional management support e-learning implementation in your institution?

……

……

……..

2. What strategies does your institution use to enhance the efficiency of your e-Learning infrastructure?

……

……

……

……

3. What challenges does the institution face in enhancing ICT competence of both the trainers and trainees?

……

……

……

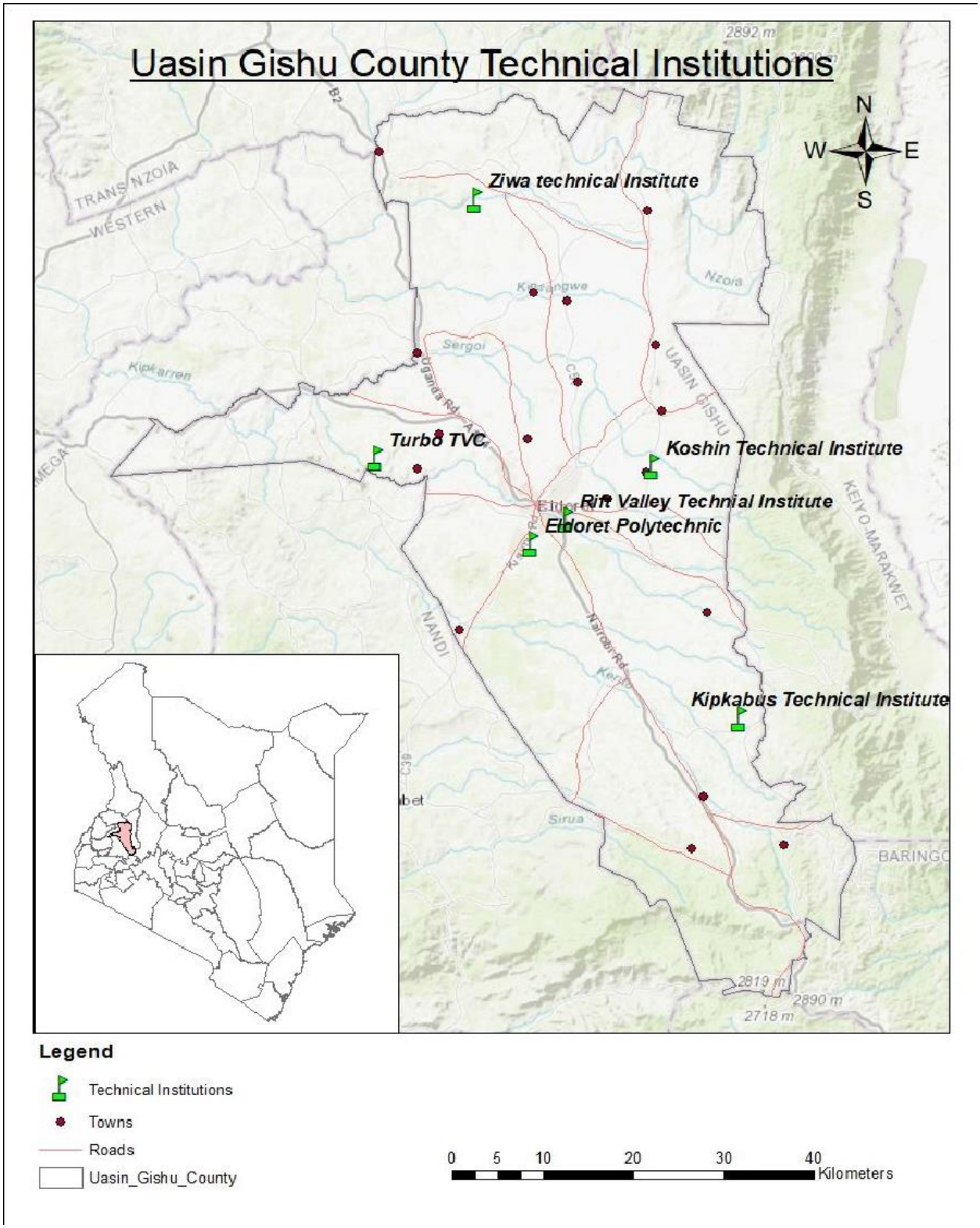
4. How does the Leadership of your institution promote knowledge sharing among its staff and trainees?

……

……

……

Appendix IV: Map of the Study Area



Source: Uasin Gishu County Technical Institutions. GmapGIS. 14/11/22

Appendix V: Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **101485**

Date of Issue: **07/September/2022**

RESEARCH LICENSE

This is to Certify that Ms.. FAITH MAIBA SISIMWO of University of Eldoret, has been licensed to conduct research in Uasin-Gishu on the topic: FACTORS INFLUENCING IMPLEMENTATION OF E-LEARNING IN TECHNICAL AND VOCATIONAL EDUCATION TRAINING INSTITUTIONS IN UASIN GISHU COUNTY, KENYA for the period ending : 07/September/2023.

License No: **NACOSTI/P/22/19861**

101485

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013

The Grant of Research Licenses is Guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014

CONDITIONS

1. The License is valid for the proposed research, location and specified period
2. The License any rights thereunder are non-transferable
3. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research
4. Excavation, filming and collection of specimens are subject to further necessary clearence from relevant Government Agencies
5. The License does not give authority to tranfer research materials
6. NACOSTI may monitor and evaluate the licensed research project
7. The Licensee shall submit one hard copy and upload a soft copy of their final report (thesis) within one year of completion of the research
8. NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice

National Commission for Science, Technology and Innovation
off Waiyaki Way, Upper Kabete,
P. O. Box 30623, 00100 Nairobi, KENYA
Land line: 020 4007000, 020 2241349, 020 3310571, 020 8001077
Mobile: 0713 788 787 / 0735 404 245
E-mail: dg@nacosti.go.ke / registry@nacosti.go.ke
Website: www.nacosti.go.ke

APENDIX VI: Similarity Report

University of Eldoret

Certificate of Plagiarism Check for Synopsis

Author Name	Sisimwo Maiba Faith SEDU/TED/M/018/21
Course of Study	Type here...
Name of Guide	Type here...
Department	Type here...
Acceptable Maximum Limit	Type here...
Submitted By	titustoo@uoeld.ac.ke
Paper Title	FACTORS INFLUENCING IMPLEMENTATION OF E-LEARNING IN TECHNICAL AND VOCATIONAL EDUCATION TRAINING INSTITUTIONS IN UASIN GISHU COUNTY, KENYA
Similarity	13%
Paper ID	986418
Submission Date	2023-09-27 15:33:52

Signature of Student

University of Eldoret
UNIVERSITY LIBRARIAN
P. O. Box 1125, ELDORET-30100

Signature of Guide

Head of the Department

* This report has been generated by DrillBit Anti-Plagiarism Software