

**EFFECT OF TECHNOLOGY INNOVATION ON PERFORMANCE OF
PUBLIC TVET INSTITUTIONS IN KAKAMEGA COUNTY, KENYA.**

BY

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DECLARATION

I, the undersigned declare that this is my original research project and has not been submitted to any other institution.

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ABSTRACT

Technology innovation is argued to be transforming higher learning institutions in Kenya, including TVETs, which are seen to be evolving so as to remain relevant, deliver efficiently and enhance performance. UNESCO global rating ranks Kenya's TVET performance below average at 28%, compared to her neighbours. Moreover, their performance is characterised by inadequacy in teaching and inefficiency in administration of resources, despite massive investment in ICT. This study analysed the effect of technology innovation on performance of public TVET in Kakamega County as guided by the following specific objective: to analyse the effect of digital administration of students on performance of public TVET institutions in Kakamega County, Kenya; to assess the effect of digital information dissemination on performance of public TVET institutions in Kakamega County, Kenya, to evaluate the effects of digital learning programs on performance of public TVET institutions in Kakamega County, Kenya; and to analyse the effect of digital administration of academic staffs on performance of public TVET institutions in Kakamega County, Kenya. The study was anchored on the Theory of Diffusion of Innovation and Technology Acceptance Model. The study adopted a causal research design; target population of 71 management staffs, primary data collected using questionnaire and analysed by descriptive and correlation methods. Study findings were digital administration of students account for 21.8% ($R^2 = 0.218$) variation on performance of TVET institutions, digital information dissemination account for 5.2% ($R^2 = 0.052$) variation on performance of TVET institutions, digital learning programmes account for 10.3% ($R^2 = 0.103$) variation on performance of TVET institutions, and digital administration of academic staffs account for 26.0% ($R^2 = 0.260$) variation on performance of TVET institutions. In summary, technology innovation accounts for 38.2% variation in performance of public TVET institutions in Kakamega County, the study concludes that digital administration of students and digital learning programmes has significant effects on performance of TVET. The study recommends further analysis factors responsible for insignificant effects of digital information dissemination and administration of academic staffs.

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OPERATIONAL DEFINITION OF TERMS

Technological Innovation: This is the adoption of new technologies that are incorporated into processes or product.

Digital administrative of students' result: This means the management of student's performance results through digital platforms.

Higher learning institutions: This refers to the technical and vocational Education Training (TVET Institution in the study.

Information technology: This refers to all forms of artefacts used to create, store, exchange, and use information in digital format.

Innovation: This refers to a practice or process or product that is new.

Innovative information dissemination: This involves the use of modern wireless communication means/channels, instance messaging and social network in disseminate correspondences to both staff and students.

Innovative programme delivery: This is the adoption of technological and state of art teaching modes such as instructional radios, television personal computers, computer based instruction, internet or eLearning and mLearning etc.

Learning management system (LMS): This refers to a software application used to manage teaching content. Instructors can use the platform to post notes, give assignments and administer examinations.

Online student registration: This means the processing of student registration through internet and related platforms.

Performance: this is the overall growth and appreciation in institutions value as measured from qualitative aspects.

Technology: This is the application of scientific, well-organized knowledge to processes and products which advances education.

ACRONYMS AND ABBREVIATIONS

CVI	Content Validity Index
DAAS	Digital Administration of Academic Staffs
DAS	Digital Administration of Students
DID	Digital Information Dissemination
DLP	Digital Learning programme
DOI	Diffusion of Innovations
EU	European Union
GoK	Government of Kenya
ICT	Information and Communication Technology
PU	Perceived Usefulness
TAM	Technology Acceptance Model
TVET	Technical and Vocational Education
UN	United Nation
USA	United States of America
WB	World Bank

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The substantial investment in technology innovation, principally Information and Communication Technology (ICT), is a clear indication that higher learning institutions are conscious of technology's potential for transforming their operations thus performance (Jhuree, 2005). Technology innovation is widely acknowledged as key to economic development, since it potentially leads to productivity and competitive gains (Abrunhosa & ESa, 2008).

Several definitions of innovation have evolved. According to Schumpeter (1983) "innovation is the commercial or industrial application of something new - a new product, process or method of production; a new market or sources of supply; a new form of commercial business or financial organization. European Commission views innovation as the renewal and enlargement of the range of products and services and the associated markets; the establishment of new methods of production, supply and distribution; the introduction of changes in management, work organization, and the working conditions and skills of the work force (CEC, 1995). In the general term, innovation involves the exploitation of new ideas, and may refer to process, an attribute, or an end result. Thus, technical innovation could be viewed as the adoption of idea or behaviour that is new to the organization through use of technology (Bon & Mustafa, 2017).

Education is a social institution that serves the needs of society, is indispensable for society to survive and thrive. It should be not only comprehensive, sustainable, and superb, but must continuously evolve to meet the challenges of the fast-changing and unpredictable globalized world. This evolution must be systemic, consistent, and scalable, therefore higher learning institutions, including Technical and Vocational Education and Training (TVET) are expected to innovate and adopt modern technology in teaching/module delivery, administration and in other complex aspects of the organization to enhance performance.

Numerous scholars have argued and presented evidence to the effect that, despite its significant investment in technology and claimed benefits, the effect of technology

innovation on performance of higher learning institutions has not proved cost-effective (Wanyembi, 2002; Macharia & Nyakwende, 2009; Bertrand, 2010). TVET institutes invest heavily in technology yet failure in these technologies seems to be the norm rather than exception (Ochara, Kandiri & Johnson, 2014). This massive spending in technology innovation with little contribution on performance gives rise to a 'technology paradox'. According to Oliver (2002), this non contribution of technology innovation in higher learning institution could be attributed to its non-direct link between innovation and performance, which are in most cases are evaluated in operational efficiency and not in financial terms.

Failure to realize cost benefit advantage brought about by use of technology innovation has negative consequences. These consequences, according to Sawang and Unsworth, (2007) include loss of the potential benefit of technology integration, loss of the finances already sunk in to the project and opportunity costs relating to other resources that were sunk into the project (OseiBryson, Dong & Ngwenyama, 2008), negative image and reputation, tarnished credibility of the management involved and the likelihood that management will in future be skeptical regarding adopting further innovations (Ke & Wei, 2006; Heeks, 2002).

Johnson (2000) argued that the reason why most technology innovation projects in higher learning institutions are not effective is due to implementation challenges which make institutions fail to reap the benefits of innovation. Accordingly, ineffective implementation arising from lack of knowledge – rather than failure of the innovation being adopted in most TVET institutions in Kenya. Thus, there is an urgent need for TVET institutions in Kenya to understand the effect of technology innovation on performance of public TVET.

1.2 Statement of the Problem

Technology innovation is argued to have transformed higher leaning institution driving performance from all aspects. TVET, being a higher learning institution, are urged to evolve through technology innovation in order to remain relevance and deliver efficiently and enhance performance. The Economic Survey Report of FY 2017/2018 points an upward trend in access and use of ICT, with TVET being with 12.9%. Similarly, enrolment rate in public TVET grew by 32.3% with Kakamega

County recording lowest rate at 18.7%. UNESCO global rating ranks Kenya's TVET performance below average at 28%, compared to her neighbours, and characterised by inadequacy in teaching and inefficient administration of resources. Scholars have also reported mixed results in regards to application of technology innovation in higher learning institutions - particularly in module delivery and not on operational performance aspect of the institution as a whole. Therefore the study investigated and the effect of technology innovation processes and products on performance of public TVET institutions.

1.3 Objective of the Study

The purpose of this study was to analyse the effect of technology innovation on performance of public TVET institutions in Kakamega County, Kenya. In order to achieve this purpose, the following specific objectives were formulated and guided the study:

- i. To analyse the effect of digital administration of students on performance of public TVET institutions in Kakamega County, Kenya.
- ii. To assess the effect of digital information dissemination on performance of public TVET institutions in Kakamega County, Kenya.
- iii. To evaluate the effects of digital learning programs on performance of public TVET institutions in Kakamega County, Kenya.
- iv. To analyse the effect of digital administration of academic staffs on performance of public TVET institutions in Kakamega County, Kenya.

1.4 Research Hypothesis

- HO₁: Digital administration of students has no significant effects on performance of public TVET institutions in Kakamega County, Kenya.
- HO₂: Digital information dissemination has no significant effects on performance of public TVET institutions in Kakamega County, Kenya.
- HO₃: Digital learning programs has no significant effects on performance of public TVET institutions in Kakamega County, Kenya.

HO₄: Digital administration of academic staffs has no significant effects on performance of public TVET institutions in Kakamega County, Kenya.

1.5 Scope of the Study

The scope of the study clearly highlights the extent of content that will be covered by the means of the research in order to come to more logical conclusions and give conclusive and satisfactory answers to the research (Marshall and Rossman, 1997). The theme of this study was analysis of technology innovation and TVET institutions in Kenya. The study was carried out in public TVET in Kakamega County, Kenya. Four constructs of technology innovation processes and products namely digital administration of students, digital information dissemination, digital learning programmes and digital administration of academic staffs were assessed. Target population comprise of management staffs drawn from both teaching and administrative levels. The study duration was three months between May to July 2019.

1.6 Justification of the Study

Study findings would be great aid to both decision making and policy formulation. To commence with, findings and conclusion to be drawn from effect of technology innovation could guide TVET's management decision making toward enhancing their performance. Second, study findings could also be used in policy formulation by the government or regulators. Given the immense contribution of TVETs to economic development, study findings could provide suggestions in formulating policies that promotes TVET performance efficiency. Last but not least, the findings adds to the existing body of literature and suggest areas for further study in developing the relevant body of knowledge.

1.7 Conceptual Framework

A conceptual framework represents the researcher's synthesis of literature on how to explain a phenomenon, an understanding of how the particular variables in his study connect with each other (McGaghie et al., 2008). The study developed its conceptual framework using four independent variables of technology innovation namely digital administration of students, digital information dissemination, digital learning programmes and digital administration of academic staffs; and one

dependent variable that is performance of public TVET institutions. The study conceptualizes a causal-effect relationship between the independent and dependent variable as illustrated in figure 1.1.

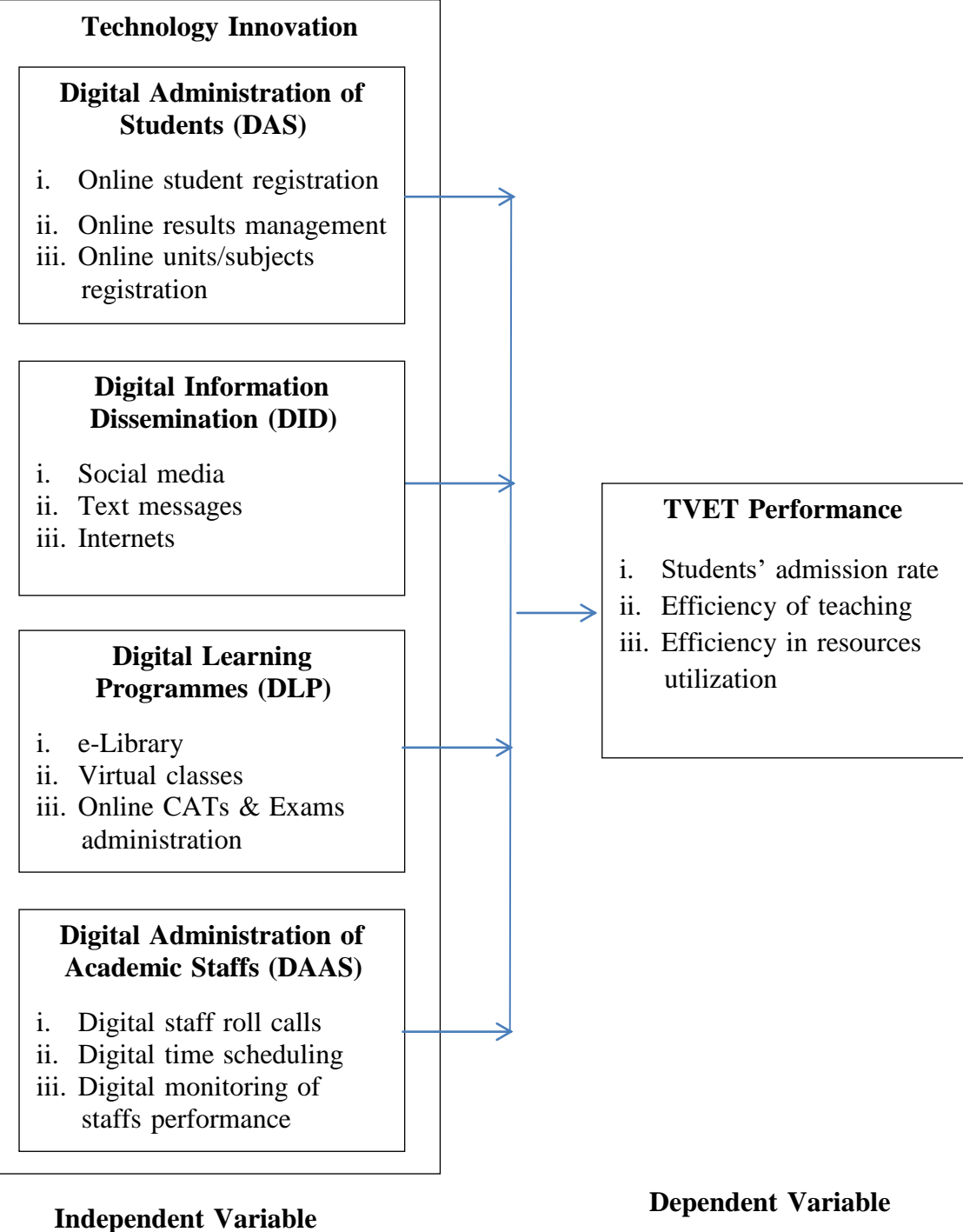


Figure 1.1: Conceptual Framework

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter review literature in order to establish what has been done regarding the research phenomena. The chapter takes a critical review of the theoretical and empirical literature on technology innovation and performance of higher learning institutions.

2.2 Theoretical Review

2.2.1 Diffusion of Innovation (DOI)

One of the theories that concisely address the innovation process was Diffusion of Innovation (DOI) theory postulated by Rogers (2003). The theory attempted to explain how to make innovation assimilated into organizations more effective. Rogers models provides the five (5) phases through which an innovation goes. These phases are: Knowledge, that is a person becomes aware of an innovation and has some idea of how it functions; Persuasion which is a person forms a favourable or unfavourable attitude toward the innovation; Decision, which is a person engages in activities that lead to a choice to adopt or reject the innovation; Implementation, which is a person puts an innovation into use, and finally Confirmation, which is a person evaluates the results of an innovation-decision already made.

Some of the proponents of the theory namely Liu, Yang, and Lin (2014) asserted that innovation spread was affected by the following attributes: relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes; compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters; complexity is the degree to which an innovation is perceived as difficult to understand and use; Trialability, which is the degree to which an innovation may be experimented with on a limited basis; and observability, which is the degree to which the results of an innovation are visible to others.

The theory has been adopted by serval authors or researchers in technology for instance Isluel, Askar and Bas (2008) used the model to explain ICT usage in University education in Colombia. They adapted DOI model to include the

attributes of ICT in classroom, ICT in lab, and innovation perceived attributes of relative advantage, compatibility, ease of use, observability and triability as contributing to ICT usage. This theory is ideal for the study in explaining or drawing insights into what qualities make an innovation spread; understanding the needs of different user segments and evaluation of the theory adoption and use.

2.1.2 Technology Acceptance Model

Technology Acceptance Model (TAM) deals with perceptions (and not systems real usage) and argues when new technological advancement is introduced to the customers. According to Lule, Omwansa and Waema (2012), ‘perceived ease of use’ is the level of confidence that people put on a system and if users perceive a new technology to be beneficial in support of both short and long-run, there is that encouragement to use the system. Further, the level by which an individual consider a system will boost performance in the short and long-run is the ‘perceived usefulness’.

The TAM affirms that the systems real utilization is established by each user's behavioural intention for usage and is inspired by an individual's perception to the system. The theory also explains that the perception towards new technology has a direct relation to its functionality as well as the simplicity of the system (Lim & Ting, 2012). TAM considers that acceptance of technology and functionality is influenced by consumer's intentions that establish the customer's perception towards system (Mojtahed, Nunes, & Peng, 2011).

This theory is used to explain how uses and customers perception of innovation affects its performance. It will clearly explain hoe technology innovation in higher learning institutions build the level of confidence that people put on a system and its beneficial in support of both short and long-run institutions performance.

2.3 Conceptual Review

2.3.1 Technology Innovations

Technology innovation transfer has been implemented mostly in form of ICT related projects across the globe. ICT has the potential to promote business excellence, with the major benefits of computers and computerization could be

viewed as providing speed and reliability (Dodds, 2007). ICT introduces simple time saving tools and reliable infrastructure. It is in these benefits of computing, when well aligned with TVET institution's business goals, has the potential to impact performance.

Through ICT therefore, a TVET institution can tap into innovative technologies which spurs its performance. Educational technologies refer to the application of technology with the express intention of advancing education. Technological innovations that have been applied in education in recent years include instructional radio, television, personal computers, computer-based instruction, the Internet, Web 2.0, e-learning, and m-learning (Veletsianos, 2010). These educational technologies are tools applied in diverse educational settings (including distance, face-to-face, and hybrid forms of education) to meet varied education-related purposes namely instructional, social, and organizational goals.

According to Aker and Mbiti (2010), mobile phones have become more common platform of delivering TVET education in Sub-Saharan Africa, due to the convergence of mobile technologies. Veletsianos (2010) observed a 'sense of isolation' as among the greatest challenges faced by users of technology innovation in higher learning education. Similarly, Achimugu et al (2010) argued that technology innovation if well aligned with institutions goal can help expand education access, raise education quality, enhance research, thus cut management costs, and ensure proper tracking of resourcing, including human resources among others. Other benefits of technology innovation in education are expanded literacy and familiarity, including creating a wide range of business opportunities.

2.3.2 The Innovation Cycle

The innovation cycle model is proposed by Schoen et al. (2005) and advances the ideas of management of technology incubators. Schoen et al (2005) opined that past project management models were incomplete representations of the innovation cycle. Therefore, they noted that innovation is not a step-by-step, but a set of actions of operation and requires mating a good idea with an even better concept. This concept is echoed in the work of Albert Einstein, who believed that innovation was not a product of logical thought, although the result was tied to logical

structure. This relationship is displayed in figure 2.1 as adopted from Schoen et al (2005)

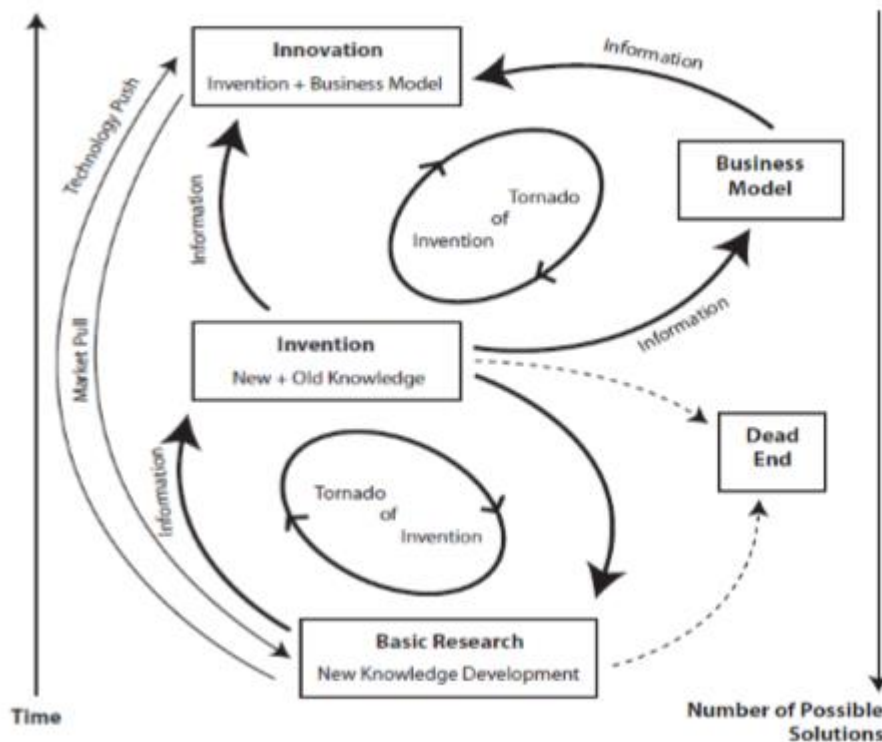


Figure 1.2: Innovation Cycle
(Source: Schoen et al, 2005)

2.3 Empirical Review

2.3.1 Technology Innovation Processes

Technical innovation process, according to Forsman and Temel (2011), represent change in the way an enterprise or institution produces products and services. Gunday *et al* (2011) argued that process innovations can be intended to decrease unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved product. Process innovations focuses on improving the effectiveness and efficiencies of production.

A study by Huang and Rice (2012) on technology innovation process and performance of commercial enterprises reported that process innovations can significantly decrease unit costs of production or delivery, significantly increase quality, thus produce or deliver new or significantly improved products. Similarly,

Lin and Chen (2007) research on process innovation reported that it can significantly strategically differentiate an organization's product offerings in the marketplace, thereby satisfying market demands, building customer loyalty, and improving firm performance.

Klein et al. (2001) studied the implementation of computerized technology and proposed a model. Specifically, the study looked at manufacturing resource planning (MRP), that is, software integrated by manufacturing firms to assist in their processes. The software assisted firms in tracking production schedules, inventory control, management of the supply of parts, and management of sales. From a sample population of 1,219 respondents, and rating of respondents' perception on a likert scale of 5-1 with 5 being strong agreement and 1 being strong disagreement. Findings revealed the following variables to be important and thus could be used to measure computerized technology implementation effectiveness: financial resource availability ($p < 0.01$); management support ($p < 0.05$); implementation climate ($p < 0.01$); and implementation policies and practice ($p < 0.001$). Furthermore, Klein et al. (2001) noted that success in implementing innovations had a great influence on an organization's survival. This study was not carried out in a higher learning institution set up.

Maditinos, Chatzoudes, and Tsairidis (2012), in their study on the effective implementation of enterprise resource planning (ERP) systems. They used a questionnaire that was distributed to 361 companies in Greece between September and December 2008. The study finding revealed that top management support greatly determined effective implementation. Other significant factors included: user support, consultant support, communication effectiveness, conflict resolution, and knowledge transfer.

Weiner et al. (2009) studied the implementation effectiveness of worksite health promotion programmes. Their study was based on technological innovations, as applied in health-promotion studies. The study defined implementation as a "course of action to put into use an idea, decision or program. Findings revealed that during implementation the of technology innovation, immediate outcome of interest reported significance correlation with adoption of technology. Thus the study

concluded that decision regarding whether to adopt or not is based on the organization use of technology.

2.3.2 Technology Innovation Products

Technology product innovation is another common typology used in most innovation studies to reflect change in end product or services. Dibrell et al (2008) views product innovation as the introduction of a good or service that is new or significantly improved regarding its characteristics or intended uses. Gunday et al (2011) observed that product innovations is creating a new good or service or improved on existing goods or services and concerned with the development new product and services for the market. Alderson (2004) research on product innovation in manufacturing industries reported that new or improved product or service for the customers has significance effect on customers' loyalty.

Gupta (2007) study on product innovations found that utilize of new knowledge or technologies, or combinations of existing knowledge or technologies to develop new innovative product and services is significantly driven by advancing technologies, changing customer needs, shortening product life cycles, and increasing global competition. Similarly, a study by Werlinger, Hawkey and Beznosov (2009), on implementing IT security. The authors argued that the organizational structure produces the different levels of implementers and also introduces the organizational dynamics; they note that the implementation process was a collective undertaking, not a 'one-man show'. Finding revealed a strong correlation between the activities in the technology innovation implementation namely planning, promotion, training, resource allocation, pilot testing with success of innovation.

In Kenya, Indeje and Zheng (2010) investigated the role of culture in information system implementation taking IFMIS as a case. The study took a structuration theory approach, and posited that the structure of "social systems exists only in so far as forums of social conduct are reproduced chronically across time and space". The study found that activities of the people alter these same social structures and create new norms, meaning and power. Similarly the study reported significance contribution of technology through use of hardware, software, suppliers and procedures and form performance. Vaughan (2001) studied involvement of users on

innovation performance in hospital information system (HIS) adoption. Their finding revealed a direct correlation with smooth implementation of the HIS. Similarly, Peng and Kurnia (2010) argued that through user involvement a strong sense of ownership is forged among end-users, thereby enhancing system acceptance.

Peansupap and Walker's (2005) research indicated that user characteristics and attitude form the motivation for use of technology ICT; and users who are eager to learn and who have high self-confidence are more likely to use new ICT applications. Importantly, previous exposure to technology might provide the much needed self-confidence on the part of the user. Damodaran (1996) contended that lack of user involvement from the preliminary stages of an ICT project is a recipe for problems for the future. In advocating addressing human (user) issues and costing them early enough in the project, Damodaran (1996) argued that it is more costly to integrate changes in post-implementation stages.

Klein and Sorra (1996) reviewed various institutional policies and practices can contribute to developing a positive organizational climate that promotes innovation use. They argued that the extent to which institutional members feel that innovation use is supported, expected or rewarded is positively associated with implementation effectiveness. Finding revealed that a strong organizational implementation climate provided more consistent high-quality innovation use in an organization, provided that the innovation fits with the intended users' values.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Research methodology defines the practices, procedure and rules that will be adopted in the study (Mugenda & Mugenda, 2007). Thus, this chapter highlighted the procedures/methods and tools that will be adopted in the research in a quest to find answers to the research questions. The chapter covers the research design, research site, target population, determination of study sample, data collection measures, data processing and analysis and finally legal and ethical consideration.

3.2 Research Design

Research design is a blueprint that guides researchers on how to collect, analyze and interpret observations. According to Degu and Yigzaw (2006) it is a logical model that guides the investigator in the various stages of the research. The study adopted causal research design. Dooley (2007) observed that causal research design explores the effect of one variable or thing on another. Additionally, Kumar (2009) asserts that causal research attempts to identify a causative relationship between an independent variable and a dependent variable. This design therefore enabled the study to explore the cause-effect relationship between technology innovation and performance of public TVET in Kakamega County.

3.3 Research Site

Research site is the geographical location of the study area, according to Creswell (2009), the physical or geographical location where the case or target population occupies. The research site was Kakamega County - one of the 47 counties in Kenya, located in the western region and occupies an area of approximately 3,033 sq. km. The County is bordered by Vihiga County to the South, Uasin Gishu County to the North East, Busia and Siaya Counties to the West, Bungoma and Trans Nzoia Counties to the North and Nandi County to the East.

The County consists of 12 sub-counties and 60 wards with a population of approximately 2 million people. Kakamega town is the administrative headquarters of the County and is the most populous township with nearly 70,000 residents. The county has 18 TVETs of which four are public TVETs.

3.3 Target Population

The target population is the group or the individuals to whom the survey applies and are in a position to answer the questions and to whom the results of the survey apply (Kitchenham & Pfleeger, 2002). The target population for this study will comprise management staffs of public TVET in Kakamega County. According to information obtained from TVET website (www.tvet.co.ke), there are four public TVET in Kakamega County, namely Butere Technical Training Institute, Shamberere Technical Training Institute, Sigalagala National Polytechnic and Bushiangala Technical Training Institute. Data on management staff, as obtained from Kakamega County Director of Education's Office, and confirmed by principals of all the four institutions, shows that there are 71 management staff, which gives a total target population of 71 distributed as shown in Table 3.I.

Table 3.1: Target Population

Technical Institutions	Management staff Population
Butere Technical Training Institute	12
Shamberere Technical Training Institute	18
Sigalagala National Polytechnic	32
Bushiangala Technical Training Institute	9
Total	71

Source: Kakamega County Director of Education Office (2019)

3.5 Sample Size and Sampling Procedure

Sampling refers to the selection of a subset of a population to act as a representative of the whole. Sampling is most preferable where the area of study is a bit widespread and the researcher cannot cover all the target population and carry out a profound assessment (Mugenda and Mugenda, 2003). However for this study, due to meagre nature of target population, census was employed to select the entire population as proposed by Kothari (2007). In addition, simple random sampling method - which regards no order or preference in selection - was adopted to select respondents issued with research instrument.

3.6 Data Collection Methods

3.6.1 Data Type and Sources

The study gathered primary and secondary data. The primary data was obtained from the respondents themselves, who express their experience regarding the technology innovation use and performance of their institution through use of structured questionnaire. On the other hand, secondary data was collected from performance reports of respective TVET institutions.

3.6.2 Data Collection Procedure

Data collection is the process of obtaining fact or raw information from sampled size in order to respond to research questions. The study embraced drop-and-pick data collection method, in which research instruments were delivered at the respondents' place of work for filling and collected two days after to enhance response rate. Prior to this, necessary approvals were observed as follows: first, the study obtained an approval letter from the university to proceed to data collection. Secondly, approval letter together with the introductory letter and research instrument were delivered to the principal of selected institutions to seek for their approval and give consent to their staffs to comply. A research assistant was recruit, train and assisted in data collection.

3.6.3 Data Collection Instruments

The instrument the study intends to utilize in collecting primary data was structured questionnaire. Questionnaires help simplify and quantify people's behaviour, characteristics or other factors about which the research is inquiring (Creswell, 2010). The questionnaire was divided into three major parts with five sections. Section I covered the introduction part, section 2 contain questions on respondents' demographic characteristics and section 3 and 6 contained research objective questions.

3.7 Pilot Test Result

The study conducted a pilot study, which according to Bordens and Abbott (2008), is as a small-scale version of the study used to establish procedures, materials and parameters to be used in the full study and test for instrument reliability and validity.

3.7.1 Instrument Reliability Test

Reliability, as observed by Mugenda and Mugenda (2003), is the extent to which a research instrument yields findings that are consistent each time it is administered to same subjects. The measurement of reliability provides consistency in the measurement variables (Kumar, 2010). Reliability of instruments was tested using Cronbach alpha – which determines internal consistency of instrument constructs (Kim & Cha, 2012). Results are shown in Table 3.1.

Table 3.1: Reliability of the Questionnaire

Items	No. of tests items	Alpha Values	Comment
Digital administration of Students	3	0.772	Accepted
Digital information dissemination.	3	0.714	Accepted
Digital learning programmes	3	0.787	Accepted
Digital administration of academic staffs	3	0.754	Accepted
Performance of TVET institutions	3	0.802	Accepted

Results in Table 3.1 indicates that digital administration of students, digital information dissemination, digital learning programmes, digital administration of academic staffs and performance of TVET institution recorded alpha value of $\alpha=0.772$, $\alpha=0.714$, $\alpha=0.787$, $\alpha=0.754$ and $\alpha=0.802$ respectively. All variable questions recorded Cronbach alpha coefficients above the cut-off point of 0.7 (Kotharu, 2014). Thus the research questionnaire represented high level of reliability and the scale used was reliable to capture the variables.

3.7.2 Validity of the Research Instruments

Validity is the degree to which research instrument measures the characteristics or trait that is intended to measure truly and accurately (Creswell, 2009). The content validity was tested by subjecting the data collection instruments to two experts for evaluation and the questionnaire was adjusted according to their comments on each item of the instruments. In addition, construct validity was enhanced by organizing the questionnaire into section with each section capturing a particular

data/information from the respondents. In addition, research questions were aligned with the conceptual framework to ensure that relevant information/data required to respond to the research objective were captured.

3.8 Data Analysis Methods

Collected data was analyzed using quantitative methods with the help of IBM-Statistical Package of Social Science (SPSS) version 22. Before analysis, data was edited, coded and classified and keyed into SPSS programme for analysis. Descriptive statistics was used to summarize findings using frequencies and percentages and multiple regression was used to establish the casual-effect interdependency between technology innovation and performance of public TVET institutions. The study regression model was as follows:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$$

Where: β_0 = Constant (coefficient of intercept)
 X_1 = Digital administrative of students (DAS)
 X_2 = Digital information dissemination (DID)
 X_3 = Digital learning programs (DLP)
 X_4 = Digital administration of academic staffs (DAAS)
 $\beta_1, \beta_2, \beta_3$ and β_4 = regression coefficient.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents data analysis results, research findings, interpretation and discussion. Results are presented in tables and figures with description and interpretation on the same thereafter. The analysed data is organized into sections commencing with response rate, demographic results and objectives findings.

4.2 Response Rate

The result of response rate is indicated in Table 4.1

Table 4.1: Response Rate

Questionnaires	Frequency	Percent
Returned completely filled	39	55.0
Returned partly filled	21	29.5
Not returned	11	15.5
Totals	71	100.00

Out of the administered 71 questionnaires, 39 questionnaires were returned completely filled, 21 returned incompletely filled and 11 not returned at all. This correspondent to 55.0%, 29.5% and 15.5% response for dully filled, partly filled and not returned questionnaires respectively. Therefore, the study only considered dully filled questionnaire for analysis, and this accounted for 55.0% response rate, compared to the recommended minimum 50% rate for descriptive study according to Kothari (2014).

4.3 Demographic Findings

This section discussed the respondent demographic findings. Three respondents' demographic variables namely gender, age and highest level of education are presented and discussed below.

4.3.1 Gender Distribution

Respondents' gender distribution results are shown in Figure 4.1.

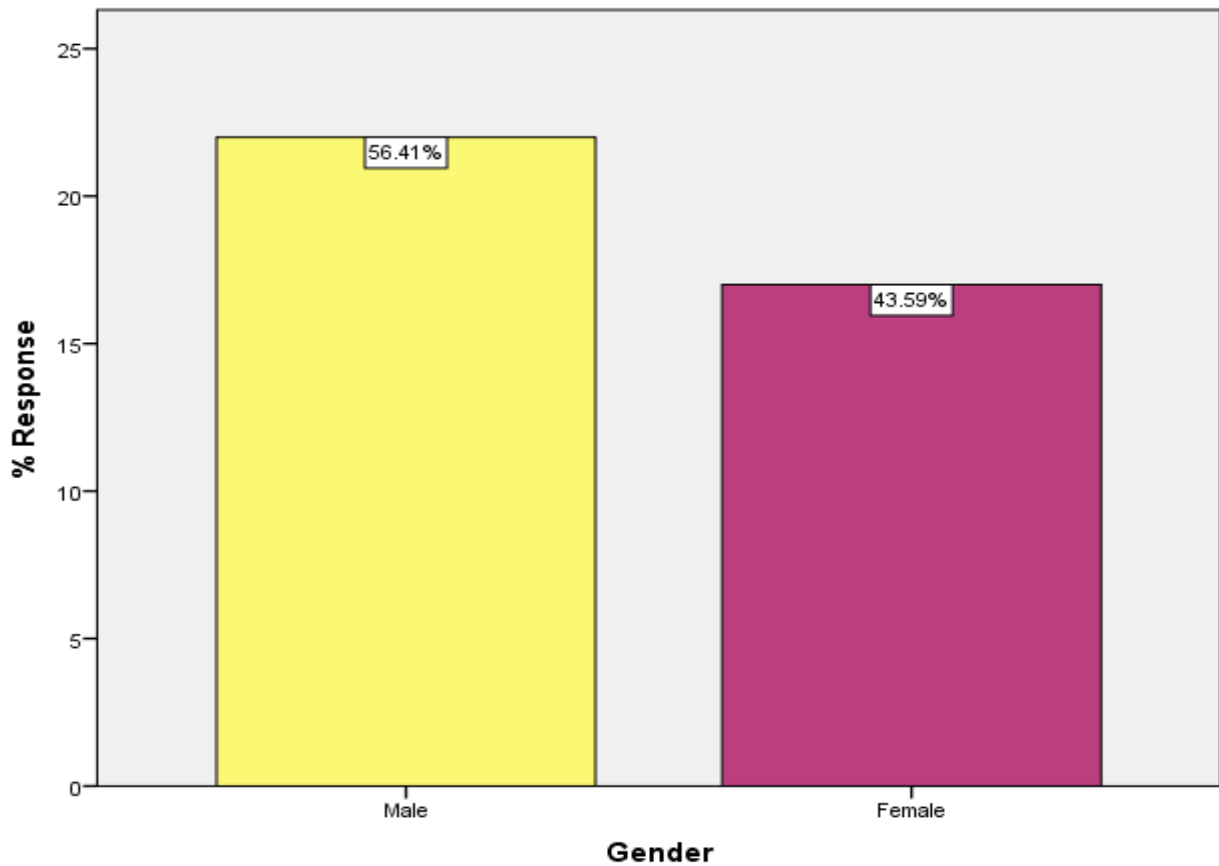


Figure 4.1: Respondent gender distribution

Figure 4.1 shows that 56.41% (N=22) of respondents who participated in the study were male genders and 43.59% (N=17) were female gender. This result reveals that male gender dominates management position in Public TVETS and the gender distribution also complied with the constitutional gender representation $\frac{1}{3}$ rule (GoK, 2010).

4.3.2 Result of Age Distribution

Respondents' were asked to indicate their age and result are shown in Figure 4.2.

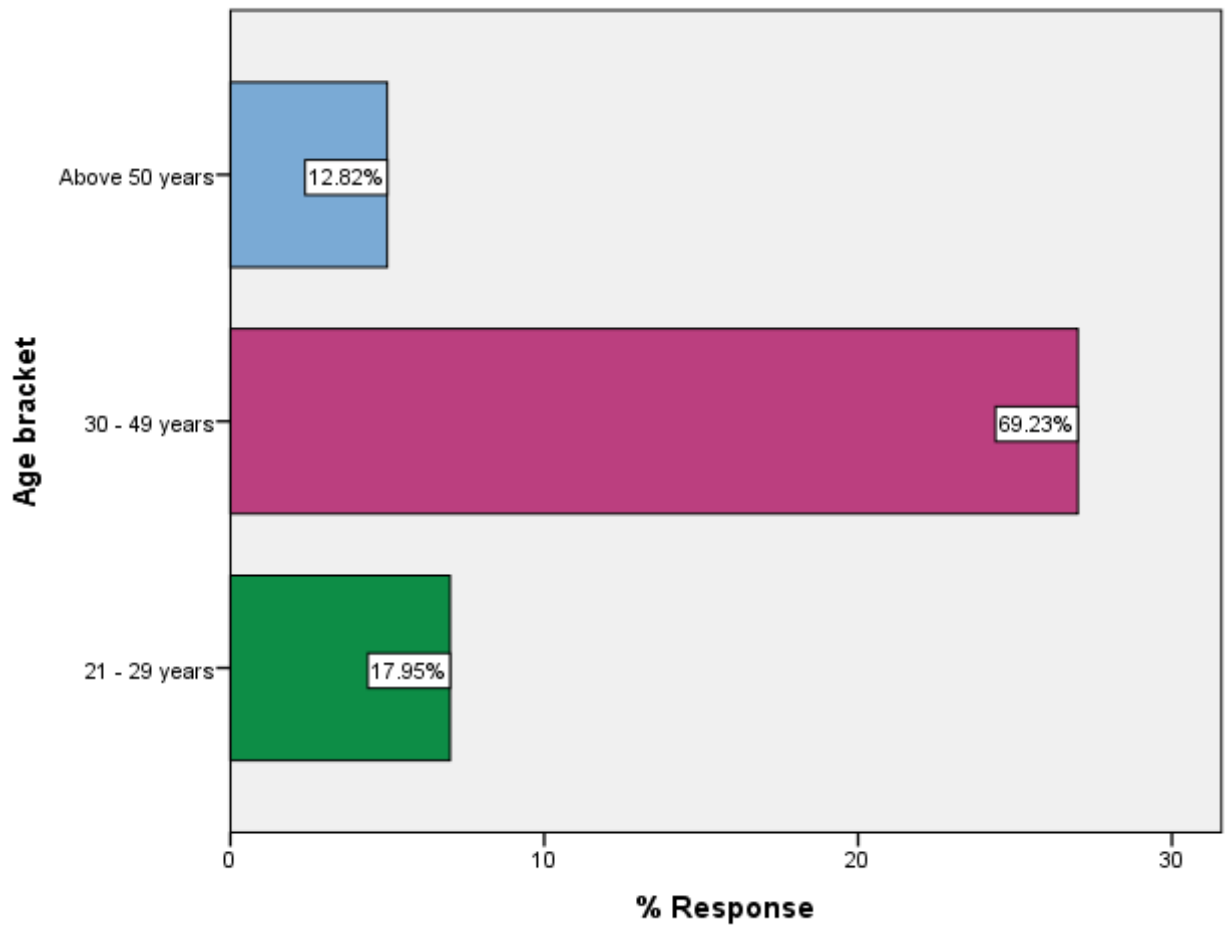


Figure 4.2: Result of respondents age distribution

Figure 4.2 result shows that 17.9% (N=7) of the respondents were aged between 21-29 years, 69.2% (N=27) aged between 30-49 years, 12.8% (N=5) aged above 50 years with none of the responded aged below 20 years. These findings indicate that majority of management staff at the public TVETS are aged between 30 and 49 years, which imply respondents were mature and thus objectively responded to research questions.

4.3.3 Highest level of Education

The study asked respondents to indicate their highest level of education achieved. This result is presented in Figure 4.3.

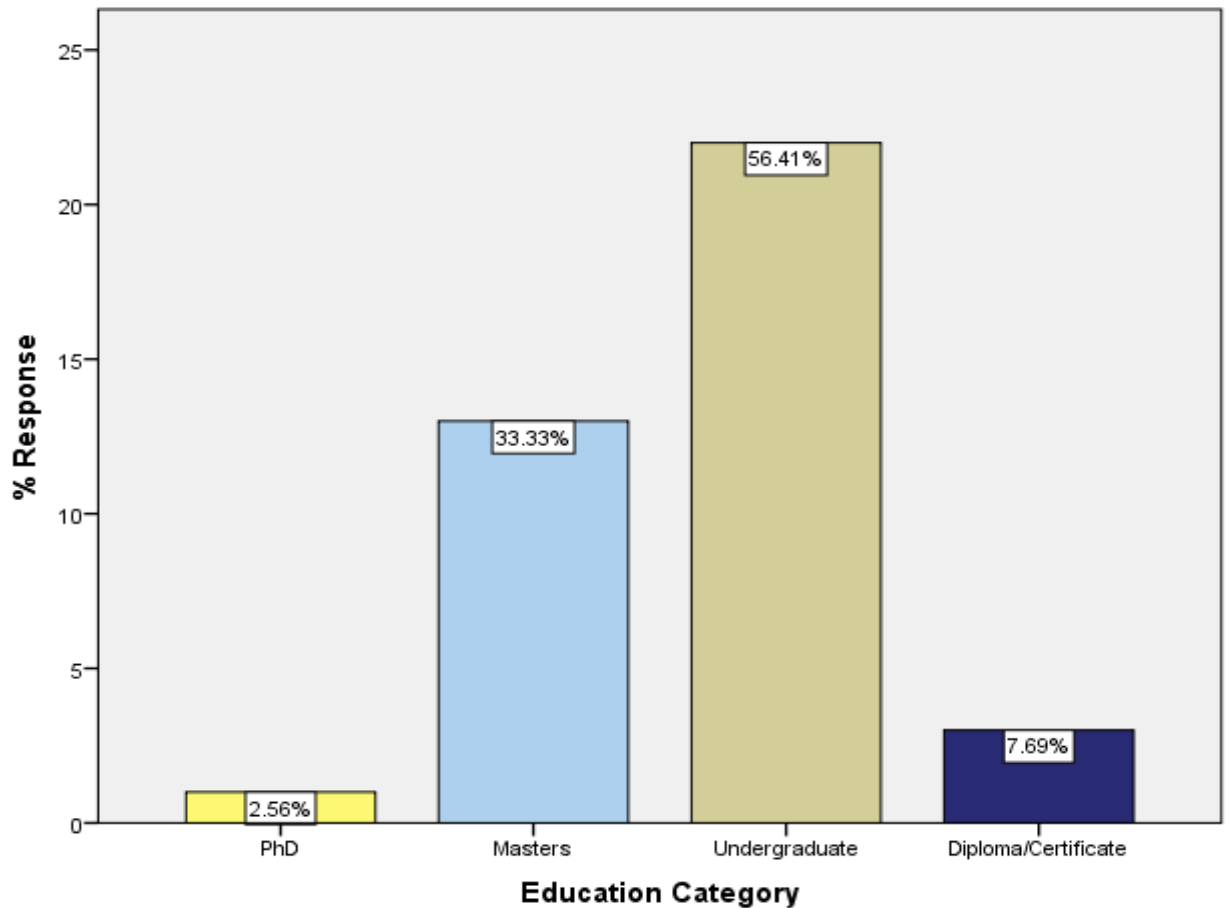


Figure 4.3: Respondents Highest Level of Education

Figure 4.3 results indicate that 2.6% (N=1) of respondent attained PhD as the highest education, 33.3% (N=13) have attained masters as highest education, 56.4% (N=22) have attained undergraduate as highest education and 7.7% (N=7) have attained Diploma as highest education. This finding reveals that majority of management staffs in public TVET institutions in Kakamega County have attained undergraduate degree as highest level of education, suggesting that university undergraduate education is a requirement for employment at managerial level in higher learning institutions.

4.3.4 Years Worked for the Institution

The study asked respondents to specify how long they have worked for the institution. Result are shown in Figure 4.4.

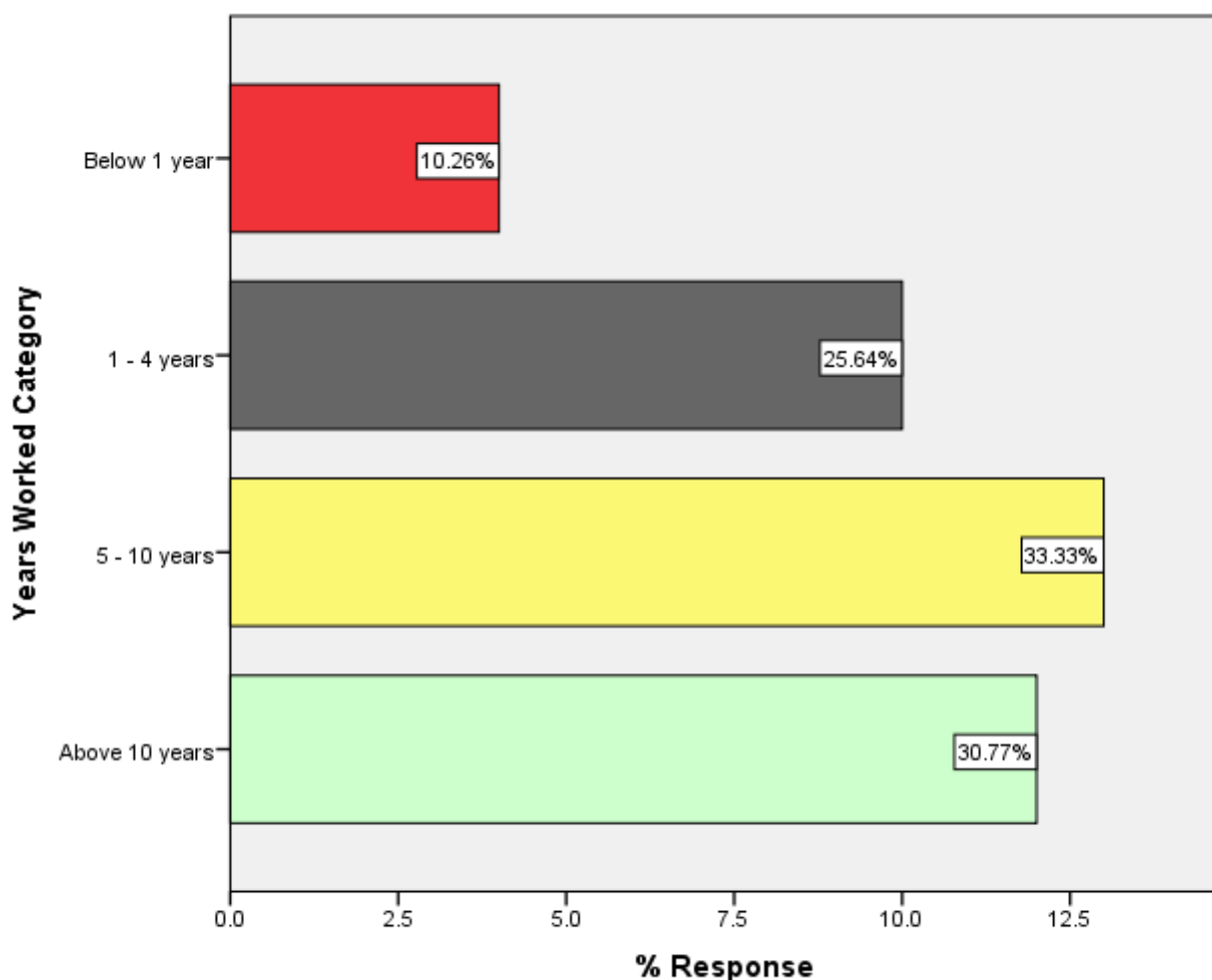


Figure 4.4: How long respondents have worked

Figure 4.4 shows 30.77% (N=12) of the respondents have worked for more than 10 year, 33.33% (N=13) have worked in management position for between 5–10 years, 25.64% (N=10) have worked for between 1-4 years and 10.3% (N=4) have worked for less than a year. These findings indicate that majority management staffs at public TVET institutions in Kakameg County have worked for more than five years. This implies respondents were experience thus provided right opinion regarding research question.

4.4 Effect of Digital Administration of Students (DAS) on Performance of Public TVET Institutions in Kakamega County

The first study objective sought to establish the effect of digital administration of students on performance of public TVET institutions in Kakamega County, Kenya.

Three statements were analysed on a likert scale of 5-1 with 5 denoting Strongly Agree (SA), 4 denoting Agree (A), 3 denoting Indifferent (I), 2 denoting Disagree (D) and 1 denoting Strongly Disagree (SD). Results and findings are discussed below.

4.4.1 Descriptive Statistics Results of Digital Administration of Student (DAS)

Descriptive results of research statements that assessed effects of DAS are presented in in Table 4.2

Table 4.2: Descriptive results of digital administration of students.

Construct Statement	N	Min	Max	S.E. of		Median	Mode	Std.
	Valid	Stats	Stats	Mean	Mean	Stats	Stats	Dev.
Online student registration	39	1	5	3.74	.102	4.00	4	.637
Online results management	39	1	5	4.13	.152	5.00	5	.951
Online unit/subject registration	39	1	5	4.26	.102	4.00	4	.637

Table 4.2 shows results of management staffs rating of statement on DAS. Results of online student registration statement (DAS1) reveals mean ($\mu=3.74$) with standard error of means (S.E. = 0.102), medium statistics ($x=4$), mode statistics ($m=4$) and standard deviation ($\sigma=0.637$). This results indicate that statistical ratings of mean, medium and mode all falls within the ‘agrees’ on the likert scale imply that management staffs are in agreement that online student administration affects institution performance.

Analysis result of online result management statement (DAS2) reveals mean $\mu=4.13$, standard error of means S.E. = 0.152, medium statistics $x=5$, mode statistics $m=5$ and standard deviation $\sigma=0.951$, indicating statistical ratings of mean, medium and mode falls within the ‘strongly agrees’ on the likert scale. This finding suggests that management staffs are in strong agreement that online students’ results management affects institution performance.

Lastly for objective one descriptive analysis, result of online units/subject registration statement (DAS3) reveals mean $\mu=4.26$, standard error of means S.E. =

0.102, medium statistics $x=4$, mode statistics $m=4$ and standard deviation $\sigma=0.637$, indicating all statistical ratings are within the ‘agrees’ response on the likert scale. This finding also suggests that management staffs are in agreement that online units/subject registrations affects institution performance. These findings agrees with finding by Klein and Sorra (1996) who reported that various higher learning institutions have adopted digital administration of students.

4.4.2 Regression Analysis Results of Digital Administration of Student (DAS)

The study conducted multiple regression analysis to assess the interdependency relationship between DAS items and public TVET institution performance in Kakamenga County. The model summary result is shown in Table 4.1.1

Table 4.2.1: Model summary result.

Model	R	R Square	Adjusted Square	R Std. Error of the Estimate	Durbin-Watson
1	.467 ^a	.218	.151	.50151	2.559

a. Predictors: (Constant), Online unit/subject registration, Online results management, Online student registration

b. Dependent Variable: Performance of TVET Institutions.

Result from Table 4.3 shows the value of R Square ($R^2 = 0.218$) which implies that digital administration of students explains 21.8% variation of public TVET institution performance. The Durbin Watson value – which measures autocorrelation among the model residuals – is 2.559 and falls within the acceptable range of 1 and 3, thus there was no autocorrelation among model residuals. The finding reasonably suggest that, holding all other factors constant, digital administration of students account for 21.8% performance of public TVET institutions in Kakamega County, Kenya. The study results collaborates finding by Klein and Sorra (1996) who reported significant influence of digital management of students on performance of technical collages.

Result of Analysis of Variance (ANOVA) is depicted in Table 4.4.

Table 4.2.2: Model summary result of DAS

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2.461	3	.820	3.261	.033 ^b
	Residual	8.803	35	.252		
	Total	11.264	38			

a. Dependent Variable: Performance of TVET Institutions

b. Predictors: (Constant), Online unit/subject registration, Online results management, Online student registration

Result from Table 4.4 shows a Means Square of regression as 0.820 and residual as 0.252, F statistics value of 3.261 and p-value of 0.033. At 0.05 level of significance, the computed F statistics is greater than critical F (3, 35) = 2.87, and since the p-value <0.05, the model is fit for the study and at least one of the elements of DAS explain public TVET institution performance.

The analysis results of the regression coefficients are shown in Table 4.3

Table 4.3: Regression coefficient results of DAS

Model		Unstandardized Coefficients		Standardized Coefficients		Sig.	Collinearity Statistics	
		B	Std. Error	Beta	t		Tolerance	VIF
1	(Constant)	1.948	.734		2.653	.012		
	Online student registration	.018	.141	.021	.130	.897	.822	1.216
	Online results management	.145	.093	.253	1.563	.127	.851	1.175
	Online unit/subject registration	.376	.135	.440	2.785	.009	.895	1.117

Table 4.3 shows the partial effects of the elements of DAS. Results shows a constant value of 1.948 which implies public TVETs performance level not dependable of the analysed elements. Additional results shows online student registration has standardised beta coefficient $\beta=0.021$, p-value=0.897; online result management has $\beta=0.253$, p-value=0.127; and online unit/subject registration has $\beta=0.440$, p-value=0.009. There results indicates that all other factors held constant, unit change on online student registration would cause insignificant 0.021 change

effect on performance of public TVET, unit change in online result management would cause insignificant 0.253 change effect on performance of public TVET; and unit change in online unit/subject registration would cause significant 0.440 change effect on performance of public TVET. The findings imply online registration of student and online result management both has insignificant positive effect while online unit/subject registration has significant positive effect on performance of public TVET institutions in Kakamega County. These findings also agrees with Peng and Kurnia (2010), Peansupap and Walker’s (2005), and Damodaran (1996) studies which all significant contribution of learning registration of students.

4.5 Effect of Digital Information Dissemination (DID) on Performance of Public TVET Institutions in Kakamega County

The second objective sought to establish the effect of digital information dissemination on performance of public TVET institutions in Kakamega County, Kenya. Results and findings are discussed below.

4.5.1 Descriptive Statistics Results of Effects of Digital Information Dissemination (DID)

Descriptive results of research statements that assessed effects of digital information dissemination are presented in in Table 4.4

Table 4.4: Descriptive results of digital information dissemination.

	N	Min	Max	S.E. of	Median	Mode	Std.	
Construct Statement	Valid	Stats	Stats	Mean	Mean	Stats	Stats	Dev.
Use of social media	39	1	5	3.74	.102	4.00	4	.737
Use of text messaging	39	1	5	4.03	.154	4.00	5	.959
Use of internet	39	1	5	4.38	.079	4.00	4	.493

Table 4.4 shows use of social media for information dissemination (DID1) reveals a mean $\mu=3.74$) with standard error of means (S.E. = 0.102), medium statistics $x=4$, mode statistics $m=4$ and standard deviation $\sigma=0.737$. since the statistical ratings of mean, medium and mode all falls within the ‘agrees’ on the likert scale, the results

suggest management staffs are in agreement that use of social media affects public TVET institution performance.

Result of use of text messaging to disseminate information (DID2) reveals mean $\mu=4.03$, standard error of means S.E. = 0.154, medium statistics $x=4$, mode statistics $m=5$ and standard deviation $\sigma=0.959$. Likewise, statistical ratings of mean, medium and mode also falls within the ‘agrees’ response on the likert scale, implying management staffs are in agreement that use of text messaging affects public TVET institution performance in Kakamega County.

Statement DID3 measured the use of internet to disseminate information. Result reveals mean $\mu=4.38$, standard error of means S.E. = 0.079, medium statistics $x=4$, mode statistics $m=4$ and standard deviation $\sigma=0.493$. This finding shows that management staffs are in agreement that use of internet to disseminate information affects TVET institution performance. These findings are in consensus with Gupta (2007) study who found digital media has wide spread use among modern institutions.

4.5.2 Regression Analysis Results of Digital Information Dissemination (DID)

The model summary result is shown in Table 4.4.1

Table 4.4.1: Model summary result of DID

Model	R	R Square	Adjusted Square	R Std. Error of the Estimate	Durbin-Watson
1	.228 ^a	.052	.029	.55234	2.439

a. Predictors: (Constant), Use of internet, Use of social media, Use of text messaging

b. Dependent Variable: Performance of TVET Institutions.

Result from Table 4.4.1 shows the value of R Square ($R^2 = 0.052$) which implies that digital information dissemination explains 5.2% variation of public TVET institution performance. The Durbin Watson value of 2.439 also shows there is no autocorrelation among model residuals. The finding reasonably suggest that, holding all other factors constant, digital information dissemination account for

5.2% performance of public TVET institutions in Kakamega County, Kenya. Equally, the study findings corroborates Gupta (2007) study which reported significant influence of digital information services on performance of learning institutions. Result of Analysis of Variance (ANOVA) is depicted in Table 4.5.

Table 4.5: Model summary result for digital information dissemination

		Sum of		Mean		
Model		Squares	Df	Square	F	Sig.
1	Regression	.586	3	.195	.640	.594 ^b
	Residual	10.678	35	.305		
	Total	11.264	38			

a. Dependent Variable: Performance of TVET Institutions

b. Predictors: (Constant), Use of internet, Use of social media, Use of text messaging

Result from Table 4.5 shows a higher Means Square of residual M.S.= 0.305 compared to regression M.S = 0.195, F statistics value of 0.640 and p-value of 0.594. Since the computed F stats is less than F critical $F(3, 35) = 2.87$ and p-value is greater than 0.05 at 0.05 level of significance, the model is not fit for the study as it cannot be used to assess the digital information dissemination effect on public TVET institution performance.

The analysis results of the regression coefficients are shown in Table 4.6.

Table 4.6: Regression coefficient results of digital information dissemination

		Unstandardized Coefficients		Standardized Coefficients		Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance VIF
1	(Constant)	2.744	.995		2.759	.009	
	Use of social media	.143	.143	.167	.994	.327	.960 1.042
	Use of text messaging	.070	.134	.124	.526	.602	.489 2.044
	Use of internet	.247	.256	.223	.963	.342	.504 1.986

The partial effects of elements of digital information dissemination, shown in Table 4.5, reveals a constant value of 2.774 and implies the public TVETs performance level not dependable of the analysed elements. Further result shows use of social

media has standardised beta coefficient $\beta=0.167$, $p\text{-value}=0.327$; use of text messaging has $\beta=0.124$, $p\text{-value}=0.602$; and use of internet has $\beta=0.223$, $p\text{-value}=0.342$. These results imply that a unit change on use of social media to disseminate information would cause insignificant 0.167 change effect on performance of public TVET, a unit change on use of text messaging would cause insignificant 0.123 change effect on performance of public TVET; and a unit change on use of internet in dissemination of information would cause insignificant 0.223 change effect on performance of public TVET. The findings suggest that all elements of digital information dissemination have insignificant positive effect on performance of public TVET institutions in Kakamega County. The results are in agreement with Huang and Rice (2012) and Klein et al. (2001).

4.6 Effect of Digital Learning Programmes (DLP) on Performance of Public TVET Institutions in Kakamega County

The third objective assessed the effect of digital learning programmes on performance of public TVET institutions in Kakamega County, Kenya. Results and findings are discussed below.

4.6.1 Descriptive Statistics Results of Effects of Digital Learning Programmes (DLP)

Descriptive results of constructs or elements of digital learning programme are presented in in Table 4.7

Table 4.7: Descriptive results of digital learning programmes

Construct Statement	N Valid	Min Stats	Max Stats	Mean	S.E. of Mean	Median Stats	Mode Stats	Std. Dev.
Electronic library (e-Library)	39	1	5	4.21	.181	5.00	5	1.128
Virtual classrooms	39	1	5	3.74	.105	5.00	5	.667
Exams management system	39	1	5	4.13	.152	5.00	5	.951

Results shows the use of electronic library (e-library) (DLP1) a mean $\mu=4.21$ with standard error of means $S.E.=0.181$, medium statistics $x=5$, mode statistics $m=5$ and standard deviation $\sigma=1.128$. All the statistics ratings (mean, medium and mode) falls within the ‘strongly agrees’ option on the likert scale implying management

staffs are in strong agreement that electronic or e-library affects public TVET institution performance.

Result of use of virtual classes (DLP2) reveals mean $\mu=3.74$, standard error of means S.E. = 0.105, medium statistics $x=5$, mode statistics $m=5$ and standard deviation $\sigma=0.667$ implying management staffs are in strong agreement that use of virtual classes affects public TVET institution performance in Kakamega County.

Result of use of examination management system reveals mean $\mu=4.13$, standard error of means S.E. = 0.152, medium statistics $x=5$, mode statistics $m=5$ and standard deviation $\sigma=0.951$ implying management staffs are in agreement that use of virtual classes affects public TVET institution performance in Kakamega County, Kenya. These results collaborates with Huang and Rice (2012) and Klein et al. (2001).

4.6.2 Regression Analysis Results of Digital Learning Programme (DLP)

The model summary result is shown in Table 4.7.1

Table 4.7.1: Model summary result of DLP

Model	R	R Square	Adjusted Square	R Std. Error of the Estimate	Durbin-Watson
1	.322 ^a	.103	.027	.53714	2.550

a. Predictors: (Constant), Examination management system , Virtual classrooms , Electronic library (e-Library)

b. Dependent Variable: Performance of TVET Institutions.

Result from Table 4.7.1 shows the value of R Square ($R^2 = 0.103$) which implies that digital learning programmes explains 10.3% variation of public TVET institution performance. The Durbin Watson value of 2.550 shows there is no autocorrelation among model residuals. The finding can reasonably indicates that, holding all other factors constant, digital learning programmes account for 10.3% performance of public TVET institutions in Kakamega County, Kenya. Result of Analysis of Variance (ANOVA) is depicted in Table 4.7

Table 4.8: Model summary result for digital information dissemination

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.165	3	1.055	4.567	.035 ^b
	Residual	8.098	35	.231		
	Total	11.264	38			

a. Dependent Variable: Performance of TVET Institutions

b. Predictors: (Constant), Examination management system, Virtual classrooms, Electronic library (e-Library)

Result from Table 4.8 shows Means Square of regression M.S.=1.055, Means Square of residual M.S = 0.231, F statistics value of 4.567 and p-value of 0.035. Results shows the computed F stats is greater than F critical $F(3, 35) = 2.87$ and p-value is less than 0.05. Therefore, at 0.05 level of significance, the model is fit for the study at least one construct of digital learning programmes explain or effect public TVET institution performance.

The analysis results of the regression coefficients are shown in Table 4.9.

Table 4.9: Regression coefficient results of digital learning programmes

Model	B	Unstandardized Coefficients		Standardized Coefficients		Collinearity Statistics		
		Std. Error		Beta	t	Sig.	Tolerance	VIF
1 (Constant)	3.748	.609			6.159	.000		
Electronic library (e-Library)	.142	.086		.394	2.644	.029	.803	1.245
Virtual classrooms	.102	.142		.120	.718	.478	.923	1.083
Examination management system	.132	.106		.230	1.241	.223	.748	1.337

From table 4.9, the constant value is 3.748 and implies the public TVETs performance level not dependable of the analysed elements. Furthermore, result of use of electronic library has standardised beta coefficient $\beta=0.394$, p-value=0.029; use of virtual classroom has $\beta=0.120$, p-value=0.478; and use of examination management system has $\beta=0.230$, p-value=0.223. There results imply that a unit

change on use of e-library would cause significant positive 0.394 change effect on performance of public TVET, a unit change on use of virtual classroom would cause insignificant positive 0.120 change effect on performance of public TVET; and a unit change on use of examination management system would cause insignificant positive 0.230 change effect on performance of public TVET. The findings suggest that use of e-library has significant positive effect while use of both virtual classroom and examination management system have insignificant positive effects on performance of public TVET institutions in Kakamega County. The findings are concurrent with Huang and Rice (2012) and Maditinos et al. (2012).

4.7 Effect of Digital Administration of Academic Staffs (DAAS) on Performance of Public TVET Institutions in Kakamega County

The fourth objective assessed the effect of digital administration of academic staffs on performance of public TVET institutions in Kakamega County, Kenya. Results and findings are discussed below.

4.7.1 Descriptive Statistics Results of Effects of Digital Administration of Academic Staffs (DAAS)

Descriptive results of constructs or elements of digital learning programme are presented in in Table 4.10

Table 4.10: Descriptive results of digital administration of academic staffs

	N	Min	Max	S.E. of		Median	Mode	Std.
Construct Statement	Valid	Stats	Stats	Mean	Mean	Stats	Stats	Dev.
Digital staff roll calls	39	1	5	3.64	.119	4.00	4	.743
Digital time scheduling	39	1	5	3.74	.102	4.00	4	.637
Digital monitoring of staffs activities	39	1	5	4.08	.149	4.00	5	.929

Results result for digital staff roll calls (DAAS1) a mean $\mu=3.64$, standard error of means S.E.=0.119, medium statistics $x=4$, mode statistics $m=4$ and standard deviation $\sigma=0.743$. Statistics ratings medium and mode falls within the ‘agrees’

option on the likert scale implying management staffs are in strong agreement that digital staff roll calls affects public TVET institution performance.

Result of use of digital time scheduling (DAAS2) reveals mean $\mu=3.74$, standard error of means S.E. = 0.102, medium statistics $x=5$, mode statistics $m=4$ and standard deviation $\sigma=0.637$ which imply management staffs are in agreement that use of digital time scheduling affects public TVET institution performance in Kakamega County.

Finally, result of use of digital monitoring of staffs activities reveals mean $\mu=4.08$, standard error of means S.E. = 0.149, medium statistics $x=4$, mode statistics $m=4$ and standard deviation $\sigma=0.929$. Since the mode and medium statistics falls within the agreed option on likter scale, finding suggests that management staffs in public TVET institution are in agreement that use of digital monitoring of staff activities affects institutions performance. The findings agree with Weiner et al. (2009), Gunday et al (2011) and Gupta (2007).

4.7.2 Regression Analysis Results of Digital Administration of Academic Staff (DAAS)

The model summary result is shown in Table 4.10.1

Table 4.10.1: Model summary result of DAAS

Model	R	R Square	Adjusted Square	R Std. Error of the Estimate	Durbin-Watson
1	.510 ^a	.260	.197	.48785	2.542

a. Predictors: (Constant), Digital monitoring of staffs activities, Digital time scheduling , Digital staff roll calls

b. Dependent Variable: Performance of TVET Institutions.

Result from Table 4.10.1 shows the value of R Square ($R^2 = 0.260$) which implies that digital administration of academic staffs explains 26.0% variation of public TVET institution performance. The Durbin Watson value of 2.542 shows no autocorrelation among model residuals. Holding all other factors constant, finding indicates that digital administration of academic staffs account for 26.0% performance of public TVET institutions in Kakamega County, Kenya. Result of Analysis of Variance (ANOVA) is depicted in Table 4.11

Table 4.11: Model summary result for digital administration of academic staffs

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.934	3	.978	4.109	.013 ^b
	Residual	8.330	35	.238		
	Total	11.264	38			

a. Dependent Variable: Performance of TVET Institutions

b. Predictors: (Constant), Digital monitoring of staffs activities, Digital time scheduling, Digital staff roll calls

Result from Table 4.11 shows Means Square of regression M.S.=0.978, Means Square of residual M.S = 0.238, F statistics value of 4.109 and p-value of 0.013. Results shows computed F statistics is greater than F critical $F(3, 35) = 2.87$ and p-value is less than 0.05. Therefore, at 0.05 level of significance, the model is fit for the study at least one construct of digital administration of academic staffs explain or affect public TVET institution performance. The analysis results of the regression coefficients are shown in Table 4.12

Table 4.12: Regression coefficient results of digital administration of academic staffs

Model	Unstandardized Coefficients		Standardized Coefficients		Sig.	Collinearity Statistics	
	B	Std. Error	Beta	t		Tolerance	VIF
1 (Constant)	4.640	.645		7.191	.000		
Digital staff roll calls	.373	.114	.509	3.277	.002	.875	1.143
Digital time scheduling	.039	.131	.045	.297	.769	.903	1.107
Digital monitoring of staffs performance	.160	.094	.272	1.700	.098	.824	1.214

Results from table 4.12, the constant value is 4.640 and implies the public TVETs performance level not dependable of the analysed elements. In addition, result of use of digital staff roll calls has standardised beta coefficient $\beta=0.509$, p-value=0.002; use of digital time management has $\beta=0.045$, p-value=0.769; and use

of digital monitoring of staffs performance has $\beta=0.272$, $p\text{-value}=0.098$. These results imply that a unit change on use of digital staffs roll calls would cause significant positive 0.509 change effect on performance of public TVET, a unit change on use of digital time scheduling would cause insignificant positive 0.045 change effect on performance of public TVET; and a unit change on use of digital monitoring of staffs performance would cause insignificant positive 0.272 change effect on performance of public TVET. The findings suggest that use of digital staffs' role calls has significant positive effect while use of digital time scheduling and digital monitoring of academic staffs performance have insignificant positive effects on performance of public TVET institutions in Kakamega County. The findings agrees with Weiner et al. (2009), Gunday et al (2011) and Gupta (2007).

4.8 Effect of Technology Innovation on Performance of Public TVET Institutions in Kakamega County

In order to test the study null hypothesis, effects of technology innovation on performance of public TVET institutions in Kakamega County, Kenya was establish using multivariate regression analysis. Result of model summary is shown in Table 4.12.1

4.8.1 Regression Analysis Results of Digital Learning Programme (DLP)

The model summary result is shown in Table 4.12.1

Table 4.12.1: Model summary result of technology innovation

Model	R	R Square	Adjusted Square	R Std. Error of the Estimate	Durbin-Watson
1	.618 ^a	.382	.309	.45263	2.571

a. Predictors: (Constant), DAAS, DAS, DID, DLP

b. Dependent Variable: Performance of TVET Institutions.

Table 4.12.1 result shows a value of R Square ($R^2 = 0.382$) for all constructs of technology innovation. The result implies that technology innovation explains 38.2% variation of performance of public TVET institution in Kakamega County. The Durbin Watson value of 2.571 also shows there is no autocorrelation among model residuals. Hence, the study can reasonably suggests, holding all other factors

constant, technology innovation accounts for 38.2% variation in performance of public TVET institutions in Kakamega County, Kenya. . The results are in agreement with Huang and Rice (2012) and Klein et al. (2001).

Result of Analysis of Variance (ANOVA) is depicted in Table 4.13.

Table 4.13: Model summary result of technology innovation

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4.298	4	1.075	5.245	.002 ^b
	Residual	6.966	34	.205		
	Total	11.264	38			

a. Dependent Variable: Performance of TVET Institutions

b. Predictors: (Constant), DAAS, DAS, DID, DLP

Result from Table 4.13 shows a high Means Square of regression M.S.=1.075 compared to Means Square of residual M.S = 0.205, F statistics value of 5.245 and p-value of 0.002. Therefore, at 0.05 level of significance, the computed F statistics is greater than F critical and the p-value < 0.05 implying the model is fit for the study at least one construct of technology innovation explain public TVET institution performance. The finding collaborates Weiner et al. (2009) study findings.

The analysis results of the regression coefficients are shown in Table 4.14

Table 4.14: Regression coefficient results of technology innovation constructs

Model		Unstandardized Coefficients		Standardized Coefficients		Collinearity Statistics		
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	2.787	.653		4.266	.000		
	DAS	.865	.244	.772	3.549	.001	.384	2.605
	DID	.330	.298	.320	1.106	.277	.217	4.608
	DLP	.859	.336	.824	2.556	.001	.175	5.720
	DAAS	.064	.245	.079	.263	.794	.203	4.921

From table 4.14, the constant value is 2.787 and implies the performance of public TVETs that does not dependable of the analysed constructs. Result for partial

effects shows digital administration of students (DAS) has standardised beta coefficient $\beta=0.272$, p-value=0.001; digital information dissemination (DID) has $\beta=0.320$, p-value=0.478; digital learning programme has $\beta=0.824$, p-value=0.001, and digital administration of academic staff has $\beta=0.079$, p-value=0.794. These results imply that a unit change on DAS would cause significant positive 0.772 change effect on performance of public TVET, a unit change on DID would cause insignificant positive 0.320 change effect on performance of public TVET, a unit change on DLP would cause significant positive 0.824 change effect on performance of public TVET. The results are in agreement with Huang and Rice (2012) and Klein et al. (2001).

Equally, these findings suggest that DAS and DLP have significant positive effect on performance of public TVET institutions in Kakamega County while DID and DAAS have insignificant positive effects on performance of public TVET institutions in Kakamega County. The finding returns a regression equation for estimating effect of technology innovation on performance of TVET institutions as follows:

$$Y = 2.787 + 0.824X_1 + 0.772X_2 + 0.320X_3 + 0.245X_4$$

Where: X_1 = Digital learning programs (DLP)
 X_2 = Digital administrative of students (DAS)
 X_3 = Digital information dissemination (DID)
 X_4 = Digital administration of academic staffs (DAAS)

4.8.2 Hypothesis Test Results

The study developed and analysed four hypothesis based on the specific objectives. The null hypotheses were tested using parametric t-test statistics at 0.05 level of significance. The results of t-statistics as shown in Table 4.20 reveals that DAS has t-statistics of $t=3.549$, p-value=0.001; DID has $t=1.106$, p-value=0.272; DLP has $t=2.556$, p-value=0.001 and DAAS has $t=263$, p-value0.792. At t-critical value of 1.96 and p-value<0.05, the study rejects the null hypothesis one and three as digital administration of students and digital learning programmes respectively have significant effects on performance of public TVET institutions. Further to that, the study accepts null hypothesis two and four as digital information dissemination and

digital administration of academic staffs respectively have no significant effects on performance of public TVET institutions in Kakamega County, Kenya.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter sum up the study and presents summary of findings, conclusions, recommendations and suggestion for further studies.

5.2 Summary of Major Findings

Summary of demographic finding indicates that majority of management staffs at public TVET institutions in Kakamega County are male gender, with dominant age bracket of between 30 and 49 years. In addition, majority have attained undergraduate degree as highest level of education and majority of management staffs at public TVET institutions have worked for more than five years. This finding implies that respondents were experience with product management and thus provided right opinion regarding research question.

5.3 Summary of Objective Findings

5.3.1 Effects of Digital Administration of Students on Performance of Public TVET Institutions in Kakamega County

Objective one sought to establish the effect of digital administration of students on performance of public TVET institutions in Kakamega County, Kenya. Summary of descriptive results shows management staffs are: in agreement that online student registration affects TVET institution performance, strong agreement that online students' results management affects institution performance and management staffs are agreement that online units/subject registrations affects institution performance. Summary of regression findings shows digital administration of students account for 21.8% variation on performance of TVET institutions holding all other factors constant.

5.3.2 Effects of Digital Information Dissemination on Performance of Public TVET Institutions in Kakamega County

Objective two sought to establish the effect of digital information dissemination on performance of public TVET institutions in Kakamega County, Kenya. Summary of descriptive results shows management staffs are in agreement that use of social media affects public TVET institution performance, are in agreement that use of

text messaging affects public TVET institution performance and management staffs are in agreement that use of internet to disseminate information affects TVET institution performance. Summary of regression findings shows digital information dissemination account for 5.2% variation on performance of TVET institutions holding all other factors constant.

5.3.3 Effects of Digital Learning Programme on Performance of Public TVET Institutions in Kakamega County

Objective three sought to establish the effect of digital learning programme on performance of public TVET institutions in Kakamega County, Kenya. Summary of descriptive results shows management staffs are in strong agreement that electronic or e-library affects public TVET institution performance, management staffs are in strong agreement that use of virtual classes affects public TVET institution performance and management staffs are in agreement that use of virtual classes affects public TVET institution performance in Kakamega County, Kenya. Summary of regression findings shows digital learning programmes account for 10.3% variation on performance of TVET institutions holding all other factors constant.

5.3.4 Effects of Digital Administration of Academic Staffs on Performance of Public TVET Institutions in Kakamega County

Lastly, objective four established the effect of digital administration of academic staffs on performance of public TVET institutions in Kakamega County, Kenya. Summary of descriptive results shows management staffs are in strong agreement that digital staff roll calls affects public TVET institution performance, management staffs are in agreement that use of digital time scheduling affects public TVET institution performance and management staffs in public TVET institution are in agreement that use of digital monitoring of staff activities affects institutions performance. Summary of regression findings shows digital learning programmes account for 26.0% variation on performance of TVET institutions holding all other factors constant.

5.3.5 Summary of Effects of Technology Innovation on Performance of Public TVET Institutions

Summary of regression analysis to establish the variation contribution of all elements of technology innovation on performance of public TVET institutions, as well as partial contribution to test the null hypothesis shows that, holding all other factors constant, technology innovation accounts for 38.2% variation in performance of public TVET institutions in Kakamega County, Kenya. In addition, digital administration of students has significant positive partial effect, digital learning programme has significant positive partial effects; digital information dissemination has insignificant partial effects and digital administration of academic staff has insignificant partial effects; all on performance of public TVET institutions.

The resultant regression equation for estimating effect of technology innovation on performance of TVET institutions is $Y = 2.787 + 0.824X_1 + 0.772X_2 + 0.320X_3 + 0.245X_4$, where X_1 = Digital learning programs (DLP), X_2 = Digital administrative of students (DAS), X_3 = Digital information dissemination (DID) and X_4 = Digital administration of academic staffs (DAAS). The study rejects the null hypothesis one and three as digital administration of students and digital learning programmes respectively have significant effects on performance of public TVET institutions. Further to that, the study accepts null hypothesis two and four as digital information dissemination and digital administration of academic staffs respectively have no significant effects on performance of public TVET institutions in Kakamega County, Kenya

5.4 Conclusions

From the summary of objective findings, the study makes the following concludes. First, online student registration, online students' results management and online units/subject registrations affects TVET institution performance. Digital administration of students account has significant variation effect on performance of TVET institutions. Second, use of social media, use of text messaging and use of internet to disseminate information affects TVET institution performance. In addition, digital information dissemination has insignificant variation effect on performance of TVET institutions. Third, electronic or e-library, use of virtual

classes and use of virtual classes affects public TVET institution performance in Kakamega County, Kenya; digital learning programmes has significant variation effect on performance of TVET institutions holding all other factors constant. Forth, digital staff roll calls, digital time scheduling and digital monitoring of staff performance affects TVET institutions performance. Similarly, digital learning programmes has significant variation on performance of TVET institutions.

5.5 Recommendations

From the study conclusions on significant contribution of digital student administration and digital learning programme, the study recommends public TVET institution management should continue to embrace technology innovation in student administration areas learning programmes in order to achieve effectiveness and efficiency in institution performance. Secondly, from the finding on insignificant contribution of digital information dissemination and digital administration of academic staffs, the study recommends that management staffs at public TVET institutions should review the currently employed technology innovation and seek for alternatives that would enhance performance.

5.6 Areas for Further Research

Although the study achieved its objective, finding on variation contribution reveal that digital innovation accounts of only 38.2% ($R^2 = 0.382$), the study recommends further analysis to determine other factors responsible for the unexplained variation. Secondly findings on insignificant effect of digital information dissemination and digital administration of academic staffs, the study recommend a study to analyse the possible factors leading to this effect.

REFERENCES

- Achimugu, P., Oluwagbemi, O., & Oluwaranti, A. (2010). An evaluation of the impact of ICT diffusion in Nigeria's higher educational institutions. *Journal of Information Technology Impact*, 10(1), 25–34.
- Ågerfalk, P. J. (2013). Embracing diversity through mixed methods research. *European Journal of Information Systems*, 22(3), 251–256.
- Ale, K. & Chib, A. (2011). Community factors in technology adoption in primary education: Perspectives from rural India. *Information Technologies & International Development*, 7(4).
- Anderson, J. D. (2006). Qualitative and quantitative research. Available online: http://www.icoe.org/webfm_send/1936, Retrieved on 10th May 2019.
- Antonacci, D. M. (2002). Integrating technology into instruction in higher education Retrieved from: <http://associations.missouristate.edu/assets/mohighedweb/ISTechnologyIntegrationinHigherEducation.pdf>.lastaccessed15thMarch2013.
- Balasubramanian, K., Clark-Okah, W., Daniel, J., Fereira, et al. (2017). ICTs for higher education: Background paper from the Commonwealth of Learning. Paris: UNESCO.
- Bertrand, M. (2010). New Perspectives on Gender. In O. Ashenfelter, & D. Card (Eds.), *Handbook of Labor Economics Volume 4B* (pp. 1545-1592). Amsterdam: Elsevier.
- Bertrand, W. E. (2010). Higher education and technology transfer: The effects of “Technosclerosis” on development. *Journal of International Affairs*, 64(1), 101–120.

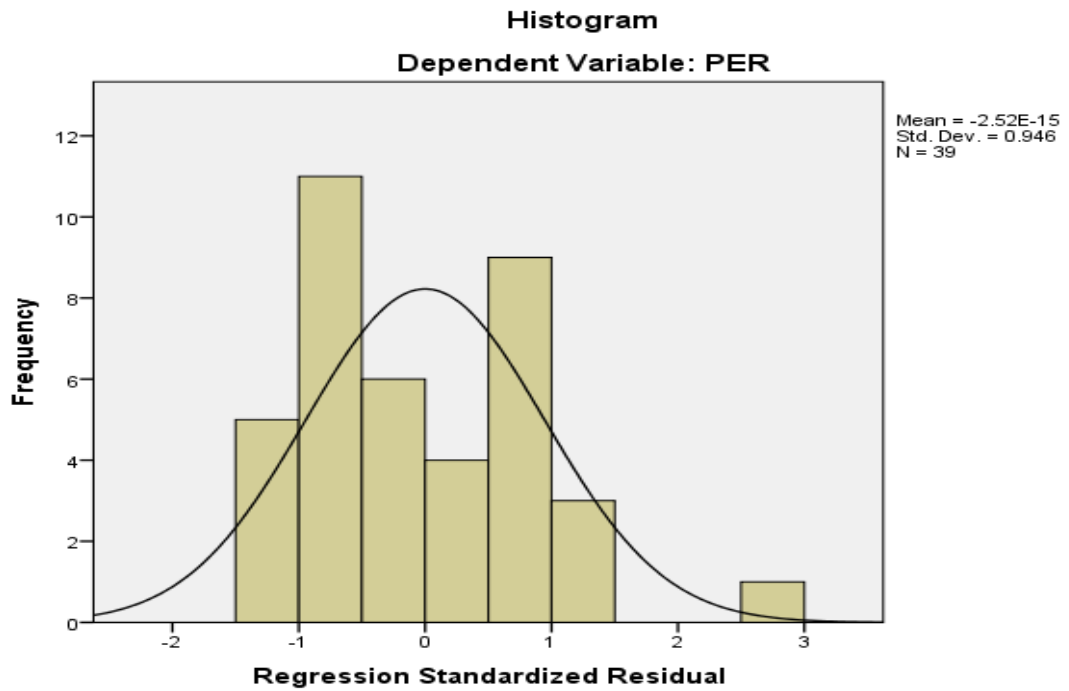
- Bon, S, and Mustafa A. (2017). Innovation in university social systems: The adoption of electronic theses and dissertations digital libraries. Unpublished PhD, University of Nairobi.
- Buabeng-Andoh, C. (2012). Factors influencing teachers' adoption and integration of information and communication technology into teaching: A review of the literature. *International Journal of Education and Development using Information and Communication Technology*, 8(1), 136-155.
- Damanpour, F. & Marguerite, S. (2009). Characteristics of innovation and innovation adoption in public organizations: Assessing the role of managers. *Journal of Public Administration Research and Theory*, 19,495–522.
- Dodds, T. (2007). Information technology, A contribution to innovation in higher education Available online:
<http://www.mendeley.com/research/informationtechnology-contributor-innovation-higher-education>.
- Fillion, G., Limayem, M., Laferrière, T., & Mantha, R. (2009). Integrating information and communication technologies into higher education: Investigating onsite and online students. *Online Learning*, 24(3), 223–240.
- Harkema, S. J. M., & Schout, H. (2008). Incorporating student-centered learning in innovation and entrepreneurship education. *European Journal of Education*, 43 (4), 513–526.
- Jaffer, S., Ng'ambi, D., & Czerniewicz, L. (2007). The role of ICTs in higher education in South Africa: One strategy for addressing teaching and learning challenges. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, 3(4), 131–142.
- Jhurree, V. (2005). Technology integration in education in developing countries: Guidelines to policy makers, *International Education Journal*, 6(4), 467–483.

- Johnson, J. D. (2000). Levels of success in implementing information technologies. *Innovative Higher Education*, 25(1), 59–76.
- Klein, K. J., & Sorra, J. S.(1996). The challenge of innovation implementation, *Academy of Management Review*, 21(4),1055–1079.
- Kothari, C. R. (2004), *Research Methodology Methods and Techniques*. 2nd Edition, New Age International Publishers, New Delhi.
- Lin, W. & Shao, B. (2000). The relationship between user participation and system success: a simultaneous contingency approach. *Information & Management*, 37, 283–295.
- Liu , C., Yang , S., Lin , I. (2014) Critical Factors of Educational Institutions Adoption for BS 10012: Personal Information Management System. *International Journal of Network Security*, 16(3), 161-167.
- Macharia, J. and Nyakwende, E. (2009) Factors Affecting the Adoption and Diffusion of Internet in Higher Educational Institutions in Kenya. *Journal of Language, Technology & Entrepreneurship in Africa*, 1, 6-23.
- Mugenda, O. M. & Mugenda, A. G. (2009). *Research methods: Quantitative and qualitative Approaches*. Nairobi: African Centre for Technology Studies.
- Nixon Muganda Ochara John Kandiri Roy Johnson , (2014),"Influence processes of implementation effectiveness in challenged information technology projects in Africa", *Information Technology & People*, Vol. 27 Iss 3 pp. 318 – 340.
- Noor, H. M. & Dzulkifli, B., (2017). Assessing the organizational climate towards developing innovative work behaviour: A literature review. 3rd International Conference on Business and Economic Research (3rd Icerb 2017) Proceeding 12 – 13 March 2017 (pp. 1487–1497).

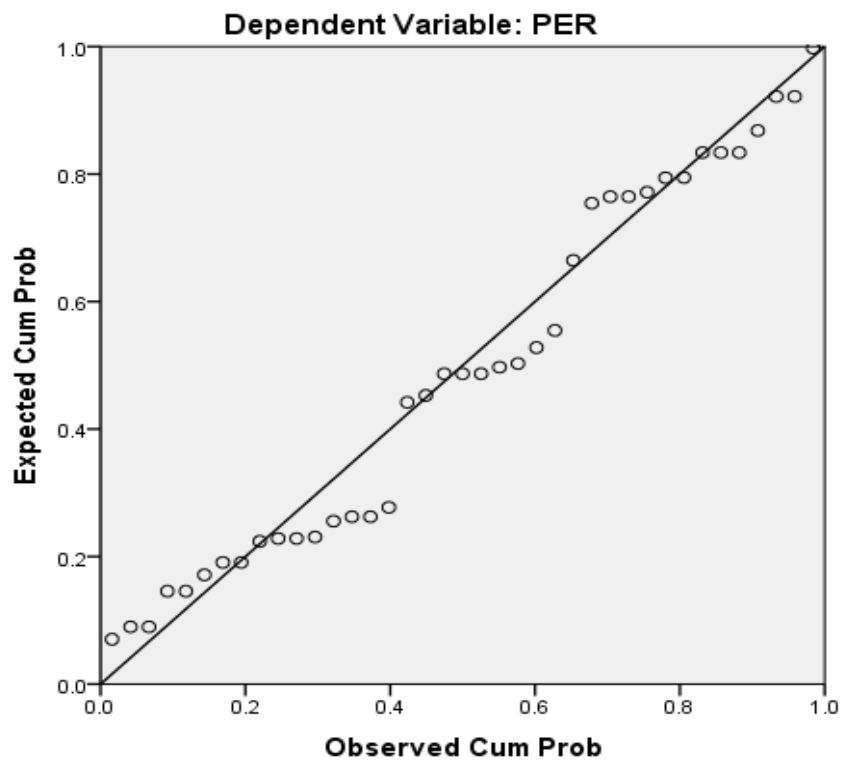
- Oliver, R. (2002). The role of ICT in higher education for the 21st century: ICT as a change agent for education. Proceedings of the Higher Education for the 21st Century Conference.
- Oliver, R. (2002). The role of ICT in higher education for the 21st century: ICT as a change agent for education. Proceedings of the Higher Education for the 21st Century Conference. Miri, Sarawak: Curtin University.
- Osei-Bryson, Kwaku-Muata & Dong, Linying & Ngwenyama, Ojelanki. (2008). Exploring managerial factors affecting ERP implementation: An investigation of the Klein-Sorra model using regression splines. *Information Systems Journal*. 18. 499-527.
- Otieno, P. (2016). The determinants of organizational innovation management effectiveness in the Thai banking industry. Unpublished PhD thesis dissertation, Kenyatta University.
- Peansupap, V and Walker, D. (2005), Factors enabling information and communication technology diffusion and actual implementation in construction organisations, *Electronic Journal of Information Technology in Construction*, 10(14), 193-218
- Rogers, E. M. (2003). *Diffusion of innovations*. New York: Free Press.
- Sawang, Sukanlaya & Unsworth, Kerrie & M. Sorbello, Tamma. (2007). An exploratory study of innovation effectiveness measurement between Australian and Thai SMEs. *International Journal of Organisational Behaviour*. 12. 110-125.
- Wanyembi, G.N.W., (2019). Improving ICT Management in Public Universities in Kenya. Retrieved from:
https://www.researchgate.net/publication/27341923_Improving_ICT_Management_in_Public_Universities_in_Kenya

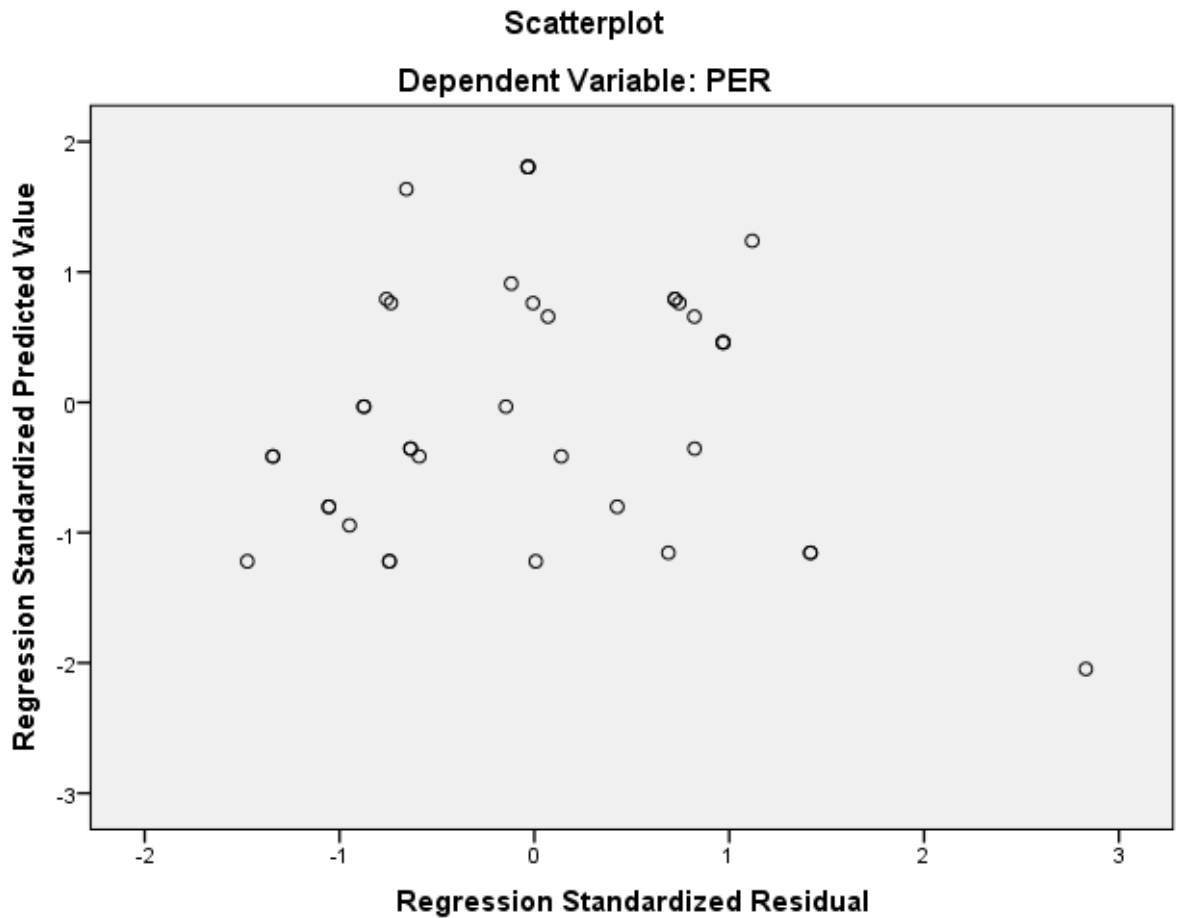
APPENDICES

Appendix I: Result of test of regression normality, linearity and multicollinearity



Normal P-P Plot of Regression Standardized Residual





Correlations

		DAS	DID	DLP	DAAS	PER
DAS	Pearson Correlation	1	.769**	.714**	.724**	.366*
	Sig. (2-tailed)		.000	.000	.000	.022
	N	39	39	39	39	39
DID	Pearson Correlation	.769**	1	.821**	.850**	.150
	Sig. (2-tailed)	.000		.000	.000	.363
	N	39	39	39	39	39
DLP	Pearson Correlation	.714**	.821**	1	.880**	.010
	Sig. (2-tailed)	.000	.000		.000	.950
	N	39	39	39	39	39
DAAS	Pearson Correlation	.724**	.850**	.880**	1	-.063
	Sig. (2-tailed)	.000	.000	.000		.705
	N	39	39	39	39	39
PER	Pearson Correlation	.366*	.150	.010	-.063	1
	Sig. (2-tailed)	.022	.363	.950	.705	
	N	39	39	39	39	39

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

* . Correlation is significant at the 0.05 level (2-tailed).

Descriptive Statistics

	N	Minimum	Maximum	Mean					
	Statistic	Statistic	Statistic	Statistic	Std. Error				
Online student registration	39	3	5	3.74	.102				
Online results management	39	3	5	4.13	.152				
Online unit/subject registration	39	3	5	4.26	.102				
Use of social media	39	3	5	3.74	.102				
Use of text messaging	39	3	5	4.03	.154				
Use of internet	39	4	5	4.38	.079				
Electronic library (e-Library)	39	2	5	4.21	.181				
Virtual classrooms	39	3	5	3.74	.102				
Examination management system	39	3	5	4.13	.152				
Digital staff roll calls	39	2	5	3.64	.119				
Digital time scheduling	39	3	5	3.74	.102				
Digital monitoring of staffs activities	39	3	5	4.08	.149				
Student admission rate	39	3	5	3.79	.075				
Teaching efficiency	39	3	5	4.15	.140				
Efficiency in resources	39	3	5	4.28	.137				
Valid N (listwise)	39								

Descriptive Statistics

	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Online student registration	.637	.271	.378	-.574	.741
Online results management	.951	-.268	.378	-1.901	.741
Online unit/subject registration	.637	-.271	.378	-.574	.741
Use of social media	.637	.271	.378	-.574	.741
Use of text messaging	.959	-.053	.378	-1.978	.741
Use of internet	.493	.494	.378	-1.854	.741
Electronic library (e-Library)	1.128	-1.122	.378	-.257	.741
Virtual classrooms	.637	.271	.378	-.574	.741
Examination management system	.951	-.268	.378	-1.901	.741
Digital staff roll calls	.743	-1.326	.378	.893	.741
Digital time scheduling	.637	.271	.378	-.574	.741
Digital monitoring of staffs activities	.929	-.159	.378	-1.874	.741
Student admission rate	.469	-.677	.378	.412	.741
Teaching efficiency	.875	-.313	.378	-1.647	.741
Efficiency in resources	.857	-.594	.378	-1.385	.741
Valid N (listwise)					

Appendix II: Letter of Introduction

Dear Sir/Madam,

RE: REQUEST FOR PARTICIPATION IN MY RESEARCH WORK.

I am a bona fide student of Maseno University currently pursuing Master of Business Administration (Strategic Management Option). As an award of degree requirement, I am currently undertaking a research study titled **“EFFECT OF TECHNOLOGY INNOVATION ON PERFORMANCE OF PUBLIC TVET INSTITUTIONS IN KAKAMEGA COUNTY, KENYA.”**

I kindly requested to undertake this study in your institution. Remember this exercise is strictly for academic purposes and any information obtained will be treated with confidentiality. A copy of the final research may be available upon request once the study is complete. Thank you in advance for your co-operation.

Yours faithfully,

Gladys Moraa Nyamagwa

Appendix III: Research Questionnaire

RESEARCH QUESTIONNAIRE

Introduction

This research instrument seeks to solicit data/information on effect of technology innovation on performance of public TVET institutions in Kakamega County, Kenya. You are kindly requested to provide as honest response/answers to the posed questions either by marking the box provided with a tick (√) or filling in the provided blank spaces. The responses you provide will be strictly confidential, and no reference will be made to any individual(s) in the report of the study. In addition, your participation is voluntarily and you are free to abandon the exercise at will. Thank you for your cooperation.

Gladys Moraa Nyamagwa

SECTION A: Demographic information

For each of the following questions, please tick OR fill as appropriate

1. What is your gender?
Male
Female

2. What is your Age bracket?
Below 20 years
Between 21- 29 years
Between 30- 49 years
Above 50 years.

3. What is your highest level of educational qualification?
PhD
Masters
Degree
Diploma/Certificate
O-Level
Others (Specify)

4. Years of Service you have worked in the institution

Below 1 year

1 – 4 years

5 – 8 years

9 years and above

SECTION B: Digital Administration of Students (DAS)

This section contains questions relating to digital administration of students. Kindly use the provided scale of 1-5 (5-Strongly agree, 4-Agree, 3-Indifference, 2-Diasagree and 1-Strongly disagree) to rate your agreement with the provided statements.

Code	Statements	Rating				
		SA (5)	A (4)	I (3)	D (2)	SD (1)
DAS1	The institute has recorded increase in online student registration?					
DAS2	The institute has embraced online student results management.					
DAS3	The institute has embraced online unit/subject registration.					

SECTION C: Digital Information Dissemination (DID)

This section contains questions relating to digital information dissemination. Use the provided scale of 1-5 (5-Strongly agree, 4-Agree, 3-Indifference, 2-Diasagree and 1-Strongly disagree), kindly rate your opinion by selecting the most appropriate option.

Code	Statements	Rating				
		SA (5)	A (4)	I (3)	D (2)	SD (1)
DID1	The institute uses social media to disseminate information to both students and staffs.					
DID2	The institute uses text messaging to disseminate information to both students and staffs.					

DID3	The institute uses internet to disseminate information to both students and staffs.					
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SECTION D: Digital Learning Programmes (DLP)

This section contains questions relating to digital learning programs. Use the provided scale of 1-5 (5-Strongly agree, 4-Agree, 3-Indifference, 2-Diasagree and 1-Strongly disagree), kindly rate your opinion by selecting the most appropriate option.

Code	Statements	Rating				
		SA (5)	A (4)	I (3)	D (2)	SD (1)
DLP1	The institute have developed electronic library (e-Library) to aid leaning and research delivery.					
DLP2	The institute uses virtual classrooms to deliver lecture to distance students.					
DLP3	The institute widely use its developed examination management system to administer CATs and Final examinations.					

SECTION E: Digital Administration of Academic Staffs (DAAS)

This section contains questions relating to digital administration of academic staffs. Use the provided scale of 1-5 (5-Strongly agree, 4-Agree, 3-Indifference, 2-Diasagree and 1-Strongly disagree), kindly rate your opinion by selecting the most appropriate option.

Code	Statements	Rating				
		SA (5)	A (4)	I (3)	D (2)	SD (1)
DAAS1	The institute has digital staff roll calls for daily registering of academic staffs present.					
DAAS2	The institute uses digital time scheduling for allocating and coordinating lecture/class timetabling.					
DAAS3	The institute has embraced digital monitoring of academic staffs performance.					

SECTION F: Performance of TVET

This section contains questions relating to TVET institution performance indicators. Kindly use the provided scale of 1-5 (5-Strongly agree, 4-Agree, 3-Indifference, 2-Diasagree and 1-Strongly disagree). You are required rate your opinion by selecting the most appropriate option.

Statements	Rating				
	SA (5)	A (4)	I (3)	D (2)	SD (1)
The institute has recorded an upward trend in student admission rate in the past five years.					
The institute has recorded an upward trend in teaching efficiency in the past five years.					
The institution has recorded increasing efficiency in resources utilization in the past five years.					

Thank you for participating.

Appendix IV: Research Budget

Item description	Unit/ unit cost	Total cost (Ksh.)
Printing services		
Proposal	40 pages@ sh. 20 (5 copies)	4,000
Questionnaire	50 pages @ sh. 10 (5 copies)	2500
Binding of proposal	70 pages @ sh. 50 (5	3500
Final project binding	copies) @ sh. 500 (5 copies)	5000
Flash Disk	2 @ sh. 700	1,400
Internet services	Sh. 1/minute	3,200
Stationary		
Writing pads	10@ Sh. 300	3000
Pens	5 @ sh. 20	100
Pencils	3 @ sh. 30	90
Photocopying services		
Questionnaires	5 pages, 32 copies @ sh.10	1,600
SPSS data analysis	Sh. 25000	25000
Publication		20,000
Contingencies	10% of Total cost	5830
TOTAL		74,138

**Appendix V: List of Registered and Active Public TVET in Kakamega County
as at December 2018**

S/No	Institution Name	Location Sub-county	Address
1.	Butere Technical Training Institute	Butere	P.O. Box 9050101 Butere 0720877456 073-5079708 buteretti@gmail.com
2.	Bushiangala Technical Training Institute	Ikolomani	P.O. Box 2227-50100 Kakamega
	Hamberere Technical Training Institute	Malava	P.O. Box 1316-50100, Kakamega
	Sigalagala National Polytechnic	Shinyalu	P.O. Box 2966-50100, Kakamega