INTEGRATION OF ICT IN TEACHING AND LEARNING IN TVET INSTITUTIONS IN THE MECHANICAL AND AUTOMOTIVE ENGINEERING DEPARTMENTS IN UASIN GISHU COUNTY

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DECLARATION

Declaration by the Candidate

This thesis is my original work and has not been submitted for any academic award in any institution, and shall not be reproduced in part or full, or any format without prior written permission from the author and/or University of Eldoret.

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DEDICATION

This Thesis is dedicated to my hubby Steve Daniel, daughters Zara Ahadi and Azar Elora who have always supported and encouraged me in my education and also to my employer The Eldoret National Polytechnic. May the almighty God bless you all.

ABSTRACT

The study focused on integration of ICT in Technical and Vocational Education and Training (TVET) institutions. Mechanical and Automotive Engineering departments were selected because of their high student population in the two sampled institutions hence it was more representative of the whole population. The Eldoret National Polytechnic and Rift Valley Technical Training Institute were selected in this study because the two institutions have the highest number of trainees in the departments of Mechanical and Automotive Engineering in the County. The objectives of this study were to: to determine the influence of human factors, pedagogic factors, curriculum factors, availability of ICT infrastructure, leadership factors and institutional policy factors on integration of ICT in teaching and learning. The study employed the Rodgers theory of Diffusion of innovation (2003). The study used both quantitative and qualitative research. Questionnaires and interview schedules were used to collect data. The target population consisted of members of governing body, trainees, trainers, ICT technicians, the Heads of Department, and the principals of the selected TVET institutions. The sample size for the trainees was 384 which was calculated by fisher's formula and was selected using the simple random sampling same as trainers while purposive sampling was used to select technicians, administrators and the members of governing body. Data was analyzed using Statistical Package for the Social Sciences (SPSS) and MS Excel software. The findings of the study reveal the following ; 76.47% of trainers have Certificate Proficiency packages in ICT, 27.45% of trainers affirmed that ICT training at their former training institution has been helpful, 15.69% had in service training, 32.50% of the male trainers use ICT in teaching while 81.81% of female trainers don't make use of ICT, 87.50% of trainers with a working experience of less than 5 years embraced use of ICT in teaching., also 35.29% of trainers use ICT-appropriate teaching methods, 31.37% were pedagogically ready to integrate ICT in teaching, 43.14% had an average of 6 hours daily of which its quite strenuous. All the respondents noted the inadequacy in ICT infrastructure.70.59% of trainers were not aware of the existence of an ICT policy. The study concluded that: few of the trainers had effective basic ICT training, ICT training in their former training institutions were not so effective, more male trainers integrated ICT in teaching than their female counterparts and also less experienced trainers utilized ICT for teaching. Most trainers admitted that they are not pedagogically ready to use ICT in teaching. In addition, ICT resources are inadequate, and trainers Lacked support from the administration. The study recommends regular in-service training for trainers and technicians, reduction of trainer's workload, provision of computer resources to trainers, trainer motivation, provision for more ICT technicians to provide technical support for trainers in the use of ICTs, and inclusion of all stakeholders in the policy making and reviewing process.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

YFT   Youth For Technology

USQ   University of Southern Queensland

USA   United States of America

UNESCO   United Nations Educational, Scientific and Cultural Organization

TVET   Technical and Vocational Education and Training

STI   Science, Technology and Innovation

OLEI   Online Lifelong Education Institute

NQF   National Qualification Framework

NCS   National Competency Standards

NCHE   National Commission on Higher Education

NACOSTI   National Commission for Science, Technology and Innovation

LAN   Local Area Network

ICT   Information and Communication Technology

EFA   Education For All

DOI   Diffusion of Innovation theory

CET   Center for Educational Technology

CBET   Competency-Based Education Training

BECTA   British Educational Communication and Technology Agency

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CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter presents the background of the study, statement of the problem, research objectives, research questions, justification of the study, significance, assumptions of the study, scope/delimitations and limitations of the study, theoretical framework, conceptual framework and operational definition of terms.

1.2 Background of the Study

The world and aspects that constitute life on earth have changed since the beginning of time and will continue to change, with new forms emerging and old ones refashioned. New socio-cultural settings will continue to emerge as generations go by. Through evolution, according to biologists, archaeologists and anthropologists, characterized the history of life since millennia, there were also some relatively speaking rapid and striking forces that transformed cultural, economic, social and political conditions of human existence" (Bekele 2004: 4). As observed in the world today, these changes have and will be dominated by the innovators or the early adopters of the change while those who are not informed or cannot immediately afford will embrace such changes too late (Fulton *et al*., 2004).

One of these recent changes is the emergence of Information and Communication Technologies (ICTs) during the second half of the of the 20th century, in which the computer and the internet are now being highly used to procure, process, store, communicate and apply information/knowledge. With the emergence of this information age, the world has become a global village with global

interconnectedness, with internal and international borders becoming bridges (Adewunmi, 2012).

Many societies in the developed as well as in the developing countries are using these devices to build up knowledge as a new weapon for rivalry and growth, for example, fighting against poverty, access to education and health services, transformation and modernization of the economy, the government and the entire society (Hare, 2007). According to Castells (2001) , ICTs act upon all domains of human activity and make it possible for endless connections to be established between different domains, as well as between elements and agents of such activities. Database systems are developed for all sorts of storages, retrieval and communication when need be; products are bought and sold in distant places electronically (online marketing) within limited time.

Tertiary education institutions, national governments, and international organizations have put a lot of emphasis on the importance of ICTs in today's society, with their teachings, training, and integration counting on universities and other tertiary education institutions. Even though Oliver (2003) asserted that education in particular has not actually felt the impact of ICTs, the situation has changed from then and today, health education, economic education, engineering education, military education, now depend on the new ICTs for research, communication, and application of research results. Ayoo (2009) remarks that ICTs at the same time continue to impact on all aspects of contemporary education, requiring tertiary education institutions and stakeholders to be linked to each other through an advanced network that is connected to the global village. Trainees and teachers, and researchers now interact online without necessarily meeting face-to-face frequently. Some universities today operate as virtual universities or with virtual libraries. The new technologies

have led to the development of off-campuses degree programs, new forms of learning in different environments or settings. For instance, today we hear of the use of e-learning, blended learning, and open and distance learning.

This trend will continue to grow with tertiary education institutions and universities described by Gornitzka *et al*. (2007) as key institutions of the modern society and Association of African Universities - AAU (2009) as intrinsic parts of the fabrics of the society, highly implicated either directly or indirectly. This require them to carry out their functions- research and teaching being the most pronounced ones, in today's context of globalization by integrating ICTs. "In a networked global environment in which every university is visible to each other, it is no longer possible for nations to completely seal off themselves from the global effects (Marginson *et al*., 2007). In addition, AAU (2009) holds that ICTs will offer universities tremendous new possibilities in research and teaching, and open wider access to information. It adds that, universities have been at the forefront of ICTs development as well as integrating and adopting these technologies into their work especially teaching, research and learning, will be of greater help to them. Lastly, as universities develop and expand the use of ICTs in their activities, this will strengthen their capacity to enhance and respond to new challenges.

Despite all these claims about extraordinary role of ICTs, there are some strong debates about their effectiveness in today's tertiary education institutions. Even though, he recognizes that education is in the state of rapid change, Sahay (2004) holds strongly that ICTs are or may pose a great threat to trainees' autonomy, which can even be potentially undermined. He equally argues that while others see ICTs as ushering in new and exciting era in education, others argue that ICTs rob education of its traditional association with books and scholarships. After placing a lot of

importance on the ICTs usage like supporting and facilitating learning, teaching, and communication and information management, Bekele (2004) made it clear that users perceive that their usage brings stress, ruins privacy, misuse of intellectual resources and diminish physical social contacts. Keogh (2001) also noted that ICTs pose some threats to the society like creating a social exclusion and creating a society of technological haves and haves not. They enhance competition in tertiary education institutions requiring them to reconsider their visions, roles, profiles, positions and make new alliances. Rodríguez-Roselló (1998) also remarked that these devices in tertiary education are very expensive and generally cause cultural imperialism.

Keeping aside their disadvantages, they still occupy a big place in tertiary education. However, developing countries are not rapidly responding to these growing demands and new challenges, though it may be expected that they will make an effort in the coming years. Rena (2008) also reiterated that Africa is one of the most under-served continents in terms of information and communication technologies. The North-South digital divide is still very wide and can open more widely if nothing is done to close up the gap. Developing countries should therefore, integrate ICTs into tertiary education with the ability, capacity, and necessary skills not only to educate trainees, and to generate new knowledge, but also to enhance national development and connect themselves to the global village.

Much has been written about the role of ICTs in teaching with much attention on developed societies and pre-university education. There is therefore a question as to whether these can be generalized to other societies in the world or the update of this is known. The answer of course may be no, and this is why the study was carried to present the picture of how the situation looks like in a developing world context. Africa does not have enough ICTs use information, as it is needed for example, AAU

(2009) remarks that there is a substantial digital divide between African universities and those elsewhere due to their differences in ICT availability, access, and affordability and capacity. It further adds that this gap can and must be bridged because if time is wasted, it will openly more widely. Chilenga (2008) notes that most of the ICT research in Africa come from South Africa, followed by Nigeria and Botswana, but even if all research done in Africa is added up, it is only 9% of the research done in Africa by African institutions. This means that about 91% is done by aliens and or is not done at all.

Farrell and Shanika (2007) indicated that much has been said about ICTs in African education for example, the rhetoric digital divide, scattered and uncoordinated initiatives of ICTs utilizing benefits, demonstrated interest from African policymakers on the use of ICTs to develop Education for All (EFA). They further remarked that despite all these, there has been no consolidated documentation of what is actually happening in Africa in this area, or a comprehensive baseline data on the state of ICTs use in education in Africa against which future developments can be compared. Bekele (2009) also remarks that "almost all previous studies are conducted in the western context and hence, the validity of such findings to other environments such as Africa is unknown".

The following studies have been conducted in Kenya, according to a study conducted by Agufana *et al*. (2018) learning to operate ICT was easy, lecturers interacted with ICT flexibly, and their interaction with ICT was easy. However, a lot of effort is required to become skilled at using ICT. Therefore, Lecturers in Technical Training Institutions perceived instructional use of ICT as easy, and this can be harnessed for use for instructional purposes. From the findings it can also be inferred that Teacher Service Commission and Board of Management of the TVET institutions in Kenya

recruit ICT competent Teachers and have carried out valuation of the technological proficiency requirements for teachers, ensuring that ICTs will meet learners' educational needs, and provision that teachers are competent to facilitate ICT-mediated learning as supported by (Bappa-Aliyu, 2012). The results revealed that teaching staff having high level of computer usage. This can be inferred that teachers have endeavored to be ICT competent through in-service program; teachers own initiative or have acquired competency from their previous Teacher Training education institutions or universities. The results were in agreement with Angeli and Valanides (2009) which have shown that in spite of the many efforts that researchers and educators put over the years in preparing teachers in the educational uses of technology, teachers still lack the skills and knowledge needed to be able to teach with technology successfully. These researchers and their reviews have attributed the failure to adequately prepare teachers to teach with ICT in TVET this can be observed in the findings that 27% of the teachers have low ICT competency. It was also observed that majority of teachers acquired basic computer operation and use of computers for word processing, spread sheet, presentation and institutional Management Information System. On use of internet and online communications, many teachers knew how to use web browsing, email, social networks and instant messaging tools. When it comes to the use of ICT to enhance the quality of teaching and learning process, most teachers fell short on this as supported by Paryono and Quito (2010), who found out that 75.1% of the respondents indicated that that the institutions have internal ICT training program for ICT users and staff members as it has been anchored in the ICT strategic plan. The findings were in agreement with the lack of incentive plans for teachers and absence of techno-pedagogical resource banks specific to the TVET systems hindrance the integration of ICTs in TVET. The

findings established the institutions have adequate ICT technicians as indicated by 60.2 % of the respondents. The ICT technician act as support person for all ICTs enquiry in the institutions especially in the laboratories and management systems. The ICT department and ICT Technician maintain the ICT infrastructure and support the users in the institution thus are critical support in integration of ICT in their respective (Hooker *et al*., 2011).

Another study revealed that the institution has qualified teachers in all the ICT subjects offered in the institutions, that teaching staff have high level of computer usage and that the institutions have adequate ICT technicians. The institutions have internal ICT training program for ICT users and staff members as it has been anchored in the ICT strategic plan. The relationship between effective integration and pedagogical readiness is significant, the correlation coefficient, R, is 0.863. Therefore, the findings revealed that effective integration is positively correlated with ICT Policy and the relationship is very strong. In conclusion effective integration is positively correlated with pedagogical readiness and the relationship is very strong. On Competency, the TSC and Board of Management of TVET institutions in Kenya recruit ICT competent teachers and though they have not carried out an assessment of the technological proficiency requirements for teachers, and provision that teachers are competent to facilitate ICT Integration in TVET (Maina *et al*., 2016).

The technical education sector in Africa has suffered from many deficiencies including quality training, contents, infrastructure, environment etc. So, at present, the greatest challenges to be faced by African technical training sector is to create a 'competency Based education training in technical education training sector' and ensure that the trainees are equipped with the required competency technically, in terms of knowledge and skills. There is a big potential of using ICT in the

development of the technical and vocational education training (TVET) in Africa. Several challenges are likely to be encountered when integrating ICT with CBET training. The challenges according to this research includes but not limited to lack of proper policies on the use of ICT in training, in adequate training of lecturers on the use of ICT in training, negative attitude of lecturers towards the use of ICT in training and lack of continuous updating in of these ICT skills amongst the lecturers. African TVET institutions cannot participate in the global competency-based education training revolution if the barrier of the trainers and learners lack ICT skills on their instructional activities, inappropriate instructional materials to meet the objectives of training and learning, in adequate motivational techniques to increase the interest to learn. Also lack of training of the lecturers on use of ICT in training is a major barrier to improve the quality of the technical and vocational education training. Updating of these skills may improve the quality of the present TVET training. Africa must prepare itself to compete effectively in the global technical training market. As the demand for skilled manpower in technical areas embraced with ICT skills is growing worldwide, the continent needs to produce a large number of competent professionals in technical areas who can cope up with the fast-growing technologies which are largely Information Technology (IT) based. For this reason, ICT tools should be provided to each TVET institution. Teachers should give their attention to use Information and communication Technology in their training and learning process. Government should provide enough budgets to ensure the requirement of ICT tools and machineries for each classroom. Government should formulate proper policy to train up the lecturers for their respective field as well as in ICT. Lecturers' motivation is a critical factor in use of ICT adoption. Policies in this area should include measures raising the confidence levels of the lecturers (by giving appropriate in-

service and initial teacher training on ICT) and also by rewarding them for the use of ICT (Songa, 2015).

All these indicate that there is an existing knowledge gap as far as the use of ICTs in teaching in African tertiary education is concerned. For TVET and their countries to bridge this gap as AAU (2009) reiterated, their individual situations in terms of views, barriers, and actual use must be identified and studied so that measures can be taken. This study is out to contribute to this knowledge gap.

1.3 Statement of the Problem

Computers are spreading rapidly in schools not just in developed countries, but increasingly in developing ones as well. However, although schools have had computers for almost two decades, ways to use them effectively have evolved slowly. Technological revolution in schools has been beset by theoretical inadequacies that have kept educational technology at the margins of the established educational system. Research findings in Kenya have revealed that there are ICT facilities in the TVET sector such as computers, computer laboratories, internet connections, alongside the traditional methods of telecommunication. Further, research has revealed that teachers do not make real use of ICTs at their disposal hence weak integration and usage in classroom activities-teaching and learning.

In addition, most TVET institutions in Kenya are in the rural areas and they face a number of challenges including; high levels of poverty, limited rural electrification and frequent power disruptions, inadequate connectivity and network infrastructure. This creates a digital divide between the rural and the urban colleges. Failure to take full advantage of the opportunities offered by technological advances to education for massive expansion represent a drastic lag in skilled innovative manpower narrowing the possibilities for individual activities in areas of business, research, learning, health

and welfare and many other daily aspects. The study sought to establish the factors that affect the integration of ICT in TVET institutions in the mechanical and automotive department in Uasin Gishu County.

1.4 Objectives of the Study

This section will focus on the main objective and the specific objectives of the study.

1.4.1 Main Objective

The main objective of this study was to investigate the factors that influence integration of ICT in teaching and learning in TVET institutions in Uasin Gishu County.

1.4.2 Specific Objectives

The following were the specific objectives of this study:

i.   To determine the influence of human factors on integration of ICT in teaching and learning at TVET institutions in Uasin Gishu County.

ii.   To establish the influence of pedagogic factors on integration of ICT in teaching and learning at TVET institutions in Uasin Gishu County.

iii. To examine the influence of curriculum factors on integration of ICT at TVET institutions in Uasin Gishu County.

iv.   To determine the influence of availability of ICT infrastructure on integration of ICT in teaching and learning at TVET institutions in Uasin Gishu County.

v.   To determine the influence of leadership factors on integration of ICT in teaching and learning at TVET institutions in Uasin Gishu County.

vi.   To examine the influence of institutional policy factors on integration of ICT in teaching and learning at TVET institutions in Uasin Gishu County.

1.5 Research Questions

In addressing the above objectives, the study sought to answer the following questions:

i. How does the human factors influence integration of ICT in teaching and learning at TVET institutions in Uasin Gishu County?

ii. How does the pedagogic factors influence integration of ICT in teaching and learning at TVET institutions in Uasin Gishu County?

iii. To what extent do the curriculum factors influence integration of ICT in teaching and learning at TVET institutions in Uasin Gishu County?

iv. How does the availability of ICT infrastructure influence integration of ICT in teaching and learning at TVET institutions in Uasin Gishu County?

v. How does the leadership factors influence integration of ICT in teaching and learning at TVET institutions in Uasin Gishu County?

vi. How does the institutional policy factors influence integration of ICT in teaching and learning at TVET institutions in Uasin Gishu County?

1.6 Justification of the Study

The study of incorporating information and communication technology in TVET institutions in various departments in TVET institutions is a relevant subject which is under-researched. This is because available literature (Todd *et al*., 2016; Lee *et al*., 2019) has dealt with different areas in ICT such as conceptual framework for integrated STEM education and factors affecting the ICT integration and implementation of one-to-one learning environment but they do not take into considerations the integration of ICT in other departments specifically Mechanical and Automotive Engineering. This being the circumstance, the study shed light on the

factors that influence integration of ICT in the Mechanical and Automotive Engineering departments.

The existing use of technology in TVET institutions has been hindered by various challenges especially financial and cultural factors which have made incorporating ICT in class a problem. Therefore, the use of ICT in class is motivating and makes learning interesting and more relevant. Through this study, the various departments in TVET institutions will understand the importance of integrating ICT in the teaching of their subjects and therefore implement them.

1.7 Significance of the Study

This study will provide knowledge of the existing integration of ICT and also form a basis for improvement in the integration of ICT in teaching and learning process. This study will assist administrators in TVET institutions to plan for resources, motivation for trainers for integration of ICT in class, design ICT policies and developing technology-facilitated educational programs, prepare trainers through in service training for integration of ICT in teaching and learning process and invent best implementation strategies.

The results of this study will also help the government through the State Department of Vocational and Technical Training to plan on how to provide financing for technological tools for integration of ICT in the teaching and learning process. This study will also add value to the existing knowledge gap on the integration of ICT in the teaching and learning process in TVET institutes therefore enabling researchers to carry out further research on the same subject.

1.8 Assumptions of the study

The study made the following assumptions:

   i.   The study assumes that integration of ICT in teaching and learning in TVET institutions is beneficial and helps achieve teaching objectives.

  ii.   The respondents will provide honest and accurate responses to the study questions.

1.9 Scope/Delimitation of the Study and Limitations of the Study

1.9.1 Scope of the Study

The study investigated integration of ICT in learning and teaching in TVET institutions in Uasin Gishu County. Mechanical and Automotive Engineering department was selected because of its large student population of 18% and 16% of the total college population at the Eldoret National Polytechnic and Rift valley Technical Training Institute respectively. The Eldoret National Polytechnic and Rift valley Technical Training Institute were selected in this study because the two institutions have Mechanical and Automotive Engineering departments that have high student population in the county, they are also well established in terms of infrastructure and human resource.

1.9.2 Limitations of the Study

The following were the limitations of the study:

   i.   The study was limited to the Mechanical and Automotive departments at Rift Valley Technical Training Institute and Eldoret Polytechnic however, will be representative of all other departments because of its high number of trainees.

ii. The findings of the study may not reflect the true picture of the whole country but it reflects the county because the Technical and Vocational Training institutions in the county share a lot of similarities therefore the sample is almost homogeneous.

1.10 Theoretical Framework

The study was based on Roger's theory of Diffusion of Innovations. The theory seeks to explain how, why, and at what rate new ideas and technology spread through cultures. The original diffusion research was done as early as 1903 by the French sociologist Gabriel Tarde. Diffusion research centers on the conditions which increase or decrease the likelihood that a new idea, product, or practice is adopted by members of a given culture or a social system. This was extended by Rogers (2003) hence at present is commonly known as Roger's theory of diffusion of innovation. Innovation diffusion research has attempted to explain the variables that influence how and why users adopt a new information medium. The diffusion of information technology and telecommunications hardware, software, and services turn out to be a powerful driver of growth, having an impact on worker productivity (Bollou, 2002).

Robinson (2009) observes that, instead of focusing on persuading individuals to change, the theory sees change as being primarily about the evolution or "reinvention" of products and behaviors so they become better fits for the needs of individuals and groups. The adoption or rejection of innovations is characterized by; the relative advantage, compatibility, simplicity, trial-ability and observability. So, the understanding and utilizing diffusion networks can aid strategy aimed at quickly inducing system-wide change (Orr, 2003; Robinson, 2009; Sahin 2006). Given that the education stakeholders are aware of the ICT innovations across the world, the rate of adoption is still very low and especially in the developing states. Rogers' diffusion

of innovations theory is the most appropriate for investigating the adoption of technology in educational environments (Medlin, 2001; Parisot, 1995).compared to the traditional methods of teaching, integration of ICT in teaching and learning in TVET institutions is an innovative application of technology, therefore this theory is the most appropriate for investigating the integration of ICT in teaching and learning in TVET institutions.

1.11 Conceptual Framework

The study focused on the interaction between the variables that influence the integration of ICT in TVET institutions in Uasin Gishu County. The independent variables are the variables the researcher cannot manipulate or change they include the human, pedagogic, curriculum, availability of ICT infrastructure, leadership, and institutional policy factors. ICT integration in teaching and learning is the dependent variable while Government Policies and Laws, CDACC, TVETA and the work place are the intervening variables. For efficient integration of ICT, there has to be adequate technical support and computer consultants to help solve technical problems for the trainers and the trainees to minimize time wastage because of technical problems. The administration should formulate ICT policies and plans as well as set ICT budget. The administration should organize for staff professional development especially through in-service training for trainers. The teaching load and the time schedule determine if the teachers have time to prepare ICT learning materials. The result of all these relationships is better learning and other outcomes such as; technology integrated lessons.

Independent Variables

Human Factors; professional development, age, gender and teaching experience

Dependent Variable

Pedagogic Factors

ICT integration in teaching and learning

Curriculum Factors; Trainers workload

Government Policies and Laws, CDACC, TVETA, Work place

Availability of ICT infrastructure

Intervening variables

Leadership Factors; technical support, administrative support

Institutional Policy Factors

Figure 1.1: Conceptual Framework

Source: Author, 2020

1.12 Operational Definition of Terms

ICT Integration: is the use of ICT as a tool to achieve the desired purpose in teaching and learning in a TVET institutions under study.

Technician: a person with technical skills trained at a TVET institution and offers technical support to lecturers and trainees under study.

Technical skills: skills that are obtained in a TVET institution and applied in the job market under study.

Trainer: a person who trains trainees in a TVET institution under study.

Trainee: a learner in a TVET institution under study.

Human factors: age, gender, teaching experience and professional development

Curriculum factors: are factors related the subjects taught to trainees in TVET institutions.

Leadership factors: technical support and administrative support

Availability of ICT infrastructure factors: are factors related to technology and determine the use, adoption and application of technology in any field of learning.

Pedagogical factors: covers methods of teaching

Institutional policy factors: Are factors that relate to written guidelines concerning the use of ICT in a TVET institution

TVET institutions: Eldoret National Polytechnic and Rift Valley Technical Institute

Administrators: Head of Department, principals and members of the board of management/ governing council

1.13 Summary

This chapter presented the background of the study, statement of the problem, research objectives, questions, justification of the study, significance, assumptions of the study, scope, delimitations, and limitations of the study, theoretical framework and operational definitions of terms.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter focuses mainly on the various scholars that have dealt with studies related to ICT specifically the role of ICT integration in teaching and learning processes in tertiary institutions, integration of ICT globally, in Africa and Kenya. Investment in education is critical to narrowing the knowledge gap and is fundamental to the development of the capacity for integrating knowledge into social and economic activities and for participating in today's digital economy. We are living in the digital age and hardly any aspect of human endeavor can be effectively carried on without ICTs. ICTs are engines for growth and tools for empowerment and they have profound implications for education change and improvement (UNESCO, 2008). The infusion of technology in education has been seen as a means to enhance and extend not only the instructional methods, but also the learning process in this 21st century (Tin, 2002).

2.2 Role of Integration of ICT in TVET

Guma *et al*. (2013) noted the following benefits of integrating ICT in teaching and learning; Grimus, pointed out that "by teaching ICT skills in higher educational institutions the students are prepared to face future developments based on proper understanding" (p. 362). They also noted that "what is now known about learning provides important guidelines for uses of technology that can help students and teachers develop the competencies needed for the twenty-first century" (p. 206). ICT originally is applied to serve as a means of improving efficiency in the educational process. Furthermore, it has been shown that the use of ICT in education can help

improve memory retention, increase motivation and generally deepens understanding. ICT can also be used to promote collaborative learning, including role playing, group problem solving activities and articulated projects.

Information and Communication Technology allow the establishment of rich networks of interconnections and relations between individuals. Some authors maintain that technology has the power to change the ways students learn and professors teach, in other words, ICT extend professors" and students" capabilities, and their well determined use can transform roles and rules in the classroom. Many people recognize ICTs as catalysts for change; change in working conditions, handling and exchanging information, teaching methods, learning approaches, scientific research, and in accessing information. Lecturers could use ICT to facilitate learning, critical thinking and peer discussions. Technology-based teaching may not be essential in all classes but generally it is most facilitative as a result of providing relevant examples and demonstrations; changing the orientation of the classroom; preparing students for employment; increasing flexibility of delivery; increasing access; and satisfying public demands for efficiency. The whole purpose of using technology in teaching is to give better value to students. This better value should also impact the learners/students" performance. ICT holds much promise for use in curriculum delivery. Thus, technology can effectively improve teaching and learning abilities, hence increasing learners" performances. ICT has the means to aid in the preparation of learners by developing cognitive skills, critical thinking skills, information access, evaluation and synthesizing skills. In addition, ICT provides fast and accurate feedback to learners. It is also believed that the use of ICTs in education could promote "deep" learning and allow educators to respond better to different needs of different learners. ICT-supported learning environments could be beneficial

to a constructivist teaching approach.(BECTA 2003 as cited by Chigona,& Chigona, (2010) Obadara and Adenaike (2008) noted the following, electronic networking provides opportunities for learners to assist each other more actively, for learners to be more active in the training and education process, and for formal no-conventional teaching methods to be utilized. ICT education at all levels of education is therefore important for survival in a globalizing labour market. ICT accelerates the management trends and changes in the world of work in general. It has the potential to improve, enormously, people's access to quality education and training, including in the workplace.

There is, however, a danger that these technologies may create a "digital divide" and worsen existing inequalities in education and training between urban and rural areas, between rich and poor, between those who possess and those who lack literacy and numeracy skills, and between developed and developing countries. Countries should therefore expand their investment in the infrastructure needed for use of ICT, in education and training hardware and software, and in the training of teachers and trainers. Such investments should be undertaken by both the public and the private sector, and make use of collaborative local, national and international networks (Johansson & Adams, 2004). Distance-learning methods can be used to make training available at convenient times, at accessible places and at reduced cost.

2.3 Integration of ICT in TVET in the World

Australia has successfully used ICT for learning and teaching in TVET institutions, this can be attributed to the country's policy to promote flexible learning. The Australian Flexible Learning Framework (2008-2011) supports VET participants to gain skill through e-learning and expand access to professional development

opportunities, products, resources and support network in an increasingly technology driven learning environment. This frame work is managed by the flexible learning advisory group (FLAG), a key policy advisory group on national directions and priorities in the ICT sector.

An example of an ICT driven TVET program in Australia is the Certificate 2 in General Education for Adults Program that is offered online at the Challenge Institute of Technology. The use of ICT has achieved the following in regards to the project: provided a more individualized, student focused learning experience with trainers as a support system, offered a more productive, supportive learning environment for distant learners, provided a more flexible, accessible learning environment for students and produce a product that could be accessible for students from a far geographical distance (UNESCO, 2017)

The Korean government seeks to increase its global competitiveness in its workforce by building a competency driven workforce rather than academic qualification. National Qualification Framework (NQF) maps the amount of education, training and work experience required for each qualification in the various industry sectors then the National Competency Standards (NCS) defines the level of knowledge skills and attitudes expected of workers for a particular task in the workplace. This has strengthened the career oriented vocational education and also specialization in universities, colleges and high schools. Demand-driven vocational curricula have boosted employment rates in Korea. Online vocational training in Korea has been funded by the ministry of employment and labor, this has enhanced flexible and lifelong learning. Online Lifelong Education Institute (OLEI) within Korea University of technology and education is a perfect example of a TVET institute that has

successfully integrated ICT in its programmers. OLEI offers approximately 300 eLearning courses both formally and informally (UNESCO, 2017).

Singapore has not been left behind in the use of ICT in TVET. Policies were formulated in order to improve on the quality of education in order to produce an efficient workforce. The education and manpower policies ensured that graduates from the various educational institutions, including TVET, had the necessary knowledge and skills for the many new jobs which were created in a rapidly 4 growing economy (Seng, 2012). The Singapore polytechnic was established with a mission to provide a caring community of inspired learners who are committed to serve with mastery.

The department of educational development offers support for its lecturers in the implementation of innovative teaching methods through professional development courses that equip them with competencies to experiment with creative approaches of instruction, providing eLearning systems along with physical resources and infrastructural support to enhance course delivery and assessment (Singapore polytechnic, 2016)" (UNESCO, 2017, p. 25).

Among other challenges, Thailand experienced a lack of quantity and quality of technical and vocational teachers (Paryono, 2015). Thailand has come up with efforts to improve TVET. They include: replacement of outdated machinery and equipment with those using new technology, training of teachers to integrate ICTs in TVET. ICTs have become part of teaching and learning process in TVET. Consequently, national policies call for expansion of existing infrastructure for staff development (UNESCO, 2003).

Saud, Shu'aibu *et al*. (2011), mentioned that, "knowledge management and information technology cannot be separated. With this amalgamation, the nature of

the work at the work places is becoming more and more digitally based and multilateral in nature. The skills required in workplaces are therefore becoming wider and more complex, with the composition of both technical and non-technical competencies" (Kim and Park, 2009).

2.4 Integration of ICT in TVET in Africa

Political, cultural, technological and economic changes determine the development of advances in learning and in the competencies needed to live actively in knowledge and lifelong-learning societies. The development of modern society is characterized by a global information space where information and communication technologies (ICTs) form a large share of gross domestic products. Considering the rapid changes of occupational profiles and the high demands for a qualified workforce, current technical and vocational education and training (t TVET) systems should be modified to meet the needs of evolving societies (Kotsik *et al.*, 2009).

Distance education programs development by the commonwealth of learning has been used to train TVET teachers in various African countries. Botswana has internet subscribers which has helped the government through the department of non-formal education through the distance education program TVET programmers through the flexible learning technologies (anta 2001a).

Youth for technology (YFT) a global organization built a sustainable digital village in Owerri, Nigeria. YFT has provided technology education for rural communities. The long-term impact for this project is to demonstrate the benefit of sustainable design on the environment and basic service to the poor while empowering young people and their communities to use technology as a tool in education and to

improve the quality of their workforce. The Owerri Digital Village offers academic learning and vocational and technology training, and provides adult education in business management skills. It exposes women to the new ICTs and how these can benefit them in their everyday life. For example, "trader women will use the e-post facilities at the digital village to deliver messages to their customers in the villages when a new shipment or stock has been received" (Ugwuegbu, 2002).

2.5 Integration of ICT in TVET in Kenya

The Kenya Vision 2030 is a vehicle for accelerating transformation of our country into a rapidly industrialized middle-income nation by the year 2030. TVET has emerged as one of the most effective human resource development strategies that Kenya need to embrace in order to train and modernize their technical workforce for rapid industrialization and national development. The argument is that in order for technical and vocational education to effectively support industrialization, skills training must be of high quality and competency-based (Wanyeki, 2012). Kenya vision 2030 is a long-term development blueprint for the country and it's anchored on three key pillars namely, economic, social and political.

It is also anchored on the following foundations; macroeconomic stability, continuity in governance reforms, enhanced equity and wealth creation opportunities for the poor infrastructure, energy, STI, land reforms, human resource development, security and public sector reforms (Republic of Kenya, 2007). All this is achievable by producing a globally competitive work in TVET. As noted by Wanyeki (2012), Vision 2030 has made it clear that Kenya must be industrialized by the year 2030. Simply put, it is having highly developed tertiary and quaternary sector of industries. It is also important to note that development in a country is also based on human resource development index. This will be done through specialized training at different levels;

community polytechnics, and the technical, industrial, vocational and entrepreneurship (Republic of Kenya, 2007)

The social pillar has the education and training sector has the following reforms to improve training in the TVET sector; upgrade institutions to enable them to provide training in some skills consistent with emerging technologies, government to accredit private TVET institutes among others.

The government through the Ministry of ICT has come up with a National ICT policy that is missioned to facilitate universal access to ICT infrastructure and services all over the country. The policy objectives are as follows; create infrastructure conditions that enable the use of always-on high speed, wireless internet across the country, facilitate the creation of infrastructure and frameworks that support the growth of data centers, pervasive instrumentation, machine learning and local manufacturing while fostering a secure, innovation ecosystem, position the country to take advantage of emerging trends by enhancing our education institutions and skills of our people and gain global recognition for innovation, efficacy and quality in public service delivery.

2.6 Factors Influencing Integration of ICT in TVET Institutions

2.6.1 Human Factors

2.6.1.1 Professional Development

Teachers' professional development is a key factor to successful integration of computers into classroom teaching. Studies have revealed that whether beginner or experienced, ICT related training programs develop teachers' competences in computer use (Bauer & Kenton, 2005). Sandholtz & Reilly (2004) claim that teachers' technology skills are strong determinant of ICT integration, but they are not conditions for effective use of technology in the classroom. They argue that training

programs that concentrate on ICT pedagogical training instead of technical issues and effective technical support, help teachers apply technologies in teaching and learning. Buabeng-Andoh (2012) mentions that the quality professional training program helps teachers implement technology and transform teaching practices (Brinkerhoff, 2006; Diehl, 2005).

Latchem (2017) notes the following concerning professional development; the role of managers and teachers in a TVET environment are quite different from the other sectors of education and in many countries there's a shortage of trained and qualified staff (Billet, 2009). Majumdar (2012) argues that there's a need for setting appropriate standards for the entry and practice in TVET teaching, attracting best teachers, improving their remuneration and career prospects and empowering them to develop leadership and management skills. Most TVET trainers and managers are unfamiliar with advanced technology hence there's a need for preservice and in-service professional development. An example of this professional development program is the "Preparing Better Teachers for Tomorrow-Online" for TVET teachers by The Ohio State University Center of Education and Training for Employment. The resources provided on that platform are self-contained and self-paced. Perienen, A. (2020) reported that teachers reiterated the need to be adequately trained in the pedagogical integration of ICT. Li, et. al(2019). Conducted a study and the result shows that six teacher level factors that are important for the ICT integration have been improved over time through professional development activities. This provides supporting evidence to educational practitioners for the implementation of effective professional development programs to promote ICT integration in education.

2.6.1.2 Trainer's ICT Competency

Research has shown that teachers require expert in technology to show them the way to integrate ICT to facilitate trainees' learning (Plair, 2008). Educators who integrate technology with new teaching practices gained through professional training can transform the performance of the trainees (Lawless & Pellegrino, 2007). Teachers who are committed to professional development activities gain knowledge of ICT integration and classroom technology organization (Wepner *et al*., 2006). Training programs for teachers that embrace educational practices and strategies to address beliefs, skills and knowledge improve teachers' awareness and insights in advance, in relation to transformations in classroom activities (Levin & Wadmany, 2008).

"Distance education is believed by many to hold promise in addressing critical problems facing skills development at present, namely: a lack of qualified instructors, the need to greatly increase the delivery of skills training on a wide scale and the need to deliver training at much lower units costs owing to constraints on financing (Stevens, 2001)" Mead Richardson & Herd ,2015) . CINTERFOR (as cited in Mead Richardson & Herd, 2015), lack of qualified instructors can be attributed to TVET's image problem. Countries moving towards ICT in TVET tend to focus first on the upgrading of teachers' ICT skills, both basic skills and the pedagogic skill-sets needed to integrate ICT into teaching and learning. GeSCI (as cited in Mead Richardson & Herd, 2015) calls for Lecturer competencies to be redefined to efficiently include ICT and pedagogic development in Africa. They have developed a set of TVET ICT teacher competencies based on the UNESCO Teacher ICT competencies.

2.6.1.3 Teaching Experience

In a survey of almost 3000 teachers, Russell *et al*. (2007) argued that the quality of ICT integration was related to the years of teacher service. Gorder (2008) reported

that teacher experience is a crucial factor influencing teachers' adoption and integration of ICT significantly correlated with the actual use of technology. In her study, she revealed that effective use of computer was related to technological comfort levels and the liberty to shape instruction to teacher-perceived student needs. Further, Lau and Sim (2008) conducted a study on the extent of ICT adoption among 250 secondary school teachers in Malaysia. Their findings revealed that older teachers frequently use computer technology in the classrooms more than the younger teachers.

The major reason could be that the older teachers having rich experience in teaching, classroom management and also competent in the use of computers can easily integrate ICT into their teaching. The result is in agreement with Russell *et al.* (2007) who found that new teachers who were highly skilled with technology more than older teachers did not incorporate ICT in their teaching. The researchers cited two reasons: new teachers focus could be on how to use ICT instead of how to incorporate ICT in their teaching. Secondly, new teachers could experience some challenges in their first few years of teaching and spend most of their time in familiarizing themselves with school's curriculum and classroom management. Goh & Sigala (2020) also reported that teachers with fewer years of teaching experience might be more likely to integrate technology into their teaching endeavor.

2.6.1.4 Gender

Markauskaite (2006) investigated gender differences in self-reported ICT experience and ICT literacy among first year graduate trainee teachers. The study revealed significant differences between males and females in technical ICT capabilities, and situational and longitudinal sustainability. Males' scores were higher. Similarly, in research conducted by Kay (2006), he found that male teachers had relatively higher

levels of computer attitude and ability before computer implementation, but there was no difference between males and females regarding computer attitude and ability after the implementation of the technology. He claims that quality preparation on technology can help lessen gender inequalities.

Further, Jamieson-Proctor, Burnett, Finger and Watson (2006) conducted a study on teachers' integration of ICT in schools in Queensland State. Results from 929 teachers indicated that female teachers were integrating technology into their teaching less than the male teachers. On the contrary, Adams (2002) stated that female teachers applied ICT more than the male teachers. Ramadan *et al*. (2018) study shows that demographically, the study found that there was no any difference in skill level due to the gender; all the TVET teachers are the same level of skills. Palomares-Ruiz et al (2020) in a study, reported that girls have more difficulties than boys in managing ICTs expertly. Another survey conducted at Najran University, Saudi Arabia obtained results indicating female teachers reported less use of ICT in their instruction than male teachers, Mahdi & Al-Dera (2013). Pozas & Letzel (2023) also report that male pre-service teachers hold more positive attitudes towards ICT use than their female counterparts

2.6.2 Pedagogic Factors

The increased use of ICT in TVET has resulted to a major paradigm shift from total dependence on the objectivist paradigm to a growing adherence to the constructivist paradigm (Chinien, 2003). The use of ICT in teaching has changed the role of TVET teacher from an instructor to a facilitator. UNESCO in their study of the 21st Century warns developing countries that there is need to develop ICT-appropriate teaching methods rather than simply adding computers to the existing methods of teaching

(UNESCO 2002). Institutions which recognize and support this changing role of the TVET teacher find a smoother path to change than those who continue to support more traditional pedagogic methods of teaching and learning.

In a study conducted in Kenya, it was found that the relationship between effective integration and pedagogical readiness is significant, the correlation coefficient, R, is 0.863. Therefore, effectively integration is positively correlated with pedagogical readiness and the relationship is very strong. Teacher's Technical Education Institutions need to develop strategies and plans to enhance the teaching learning process within teacher education programmers and to assure that all future teachers are well prepared to use the ICTs tools for teach (Maina *et al*., 2016).

2.6.3 Curriculum Factors

2.6.3.1 Trainer's workload

Many studies have revealed that the workloads of teachers influence their acceptance of technology in classrooms. For example, Samarawickrema & Stacey (2007) investigated factors related to the use of learning management system in a large multi-campus urban university in Australia. They adopted case study method and purposive sampling to select 22 participants used web-based methods to teach both on- and off-campus trainees for the study. The findings of the research found that increased workload coupled with teaching with technology was critical to the participants of the study. Factors reported to contribute to increased workload were course maintenance and constant upgrades, student emails, the learning of new skills and the continuous search of sustainable strategies.

Similarly, Neyland (2011) conducted both quantitative and qualitative research on factors influencing the integration of online learning in high schools in Sydney. The

study involved 26 computer coordinators. In an interview, one computer coordinator in a school stated that increased workload of teachers was alarming: "Asking them to take on board yet another task in an already overcrowded curriculum and extremely busy work day is pushing many teachers to the limit and in some cases beyond" (p.11).

Also, Abuhmaid (2011) conducted study on the conduct and effectiveness of ICT training courses within the Jordanian education system. The sample population was 115 teachers and 12 school principals. Interviews, questionnaires, direct classroom observations, and field-notes of classroom practices were used for data collection. In the study, one principal reported that "teachers are already overloaded; they could not cope with the pressure and the pressure from ICT training" (p.12). In addition, a teacher stated that "teachers are overloaded to learn, prepare and practice what they learn" (p.12). According to Fullan (2003), for teachers to realize the aims of educational system as well as implementing new initiatives, it necessary to lessen the workload of teachers

In a study conducted on capacity building of faculty in online course design and development it was found that the participants faced various challenges due to heavy workload and other commitments which hindered active engagement in the tasks (Karunanayaka, 2016).

A study was carried out on "psychomotor factors in the use of learning management system (LMS)" at polytechnic institutions in Malaysia. The use of LMS system in conventional education focuses more on cognitive and effective factors. This is different in the technical and vocational education which emphasizes on affective and psychomotor factors. This study investigated the importance of these two factors by conducting a literature review using terms such as practical training,

vocational training, and technical education. Findings from this study found that lecturer's workload is a crucial factor in the effectiveness in the use of learning management system in TVET (Ahmad *et al*., 2019).

2.6.4 ICT Infrastructure Factors

2.6.4.1 Accessibility to ICT infrastructure

A study by Yildrim (2007) as cited by Buabeng-Andoh (2012) found that access to technological resources is one of the effective ways to teachers' pedagogical use of ICT in teaching. The utilization of ICT in teaching and learning is popular in Vietnam and it has made changes in the system of education. ICT also be applied to organize the distance learning classes (preparation, presentation of lectures, assessment tests), curriculum development, school management. This can be attributed to the gradual implementation of ICT applications in operations and has achieved considerable results in the development of infrastructure such as LAN, high speed internet connection to serve the educational activities and training, building online learning centers, research and application of open-source software to train and use IT in almost areas of training. In 2010, under the help of Viettel Company - a company in the field of communications and information technology, all schools across the country have been connected free Internet. ICT equipment and software applications in TVET institutions in Vietnam are available in many regions although not evenly distributed (Vinh *et al*., 2010).

A study conducted in Nigeria discovered that availability of ICT infrastructure in institution was considered a prerequisite for the efficient utilization of ICT as a pedagogical tool; hence, the need to pay maximum attention to the availability of ICT facilities in this institution was emphasized. Data obtained from both the interviews

and observation conducted in this institution show that both teachers and students are in favor of using ICT. The first teacher interviewed stated that the institution has four different centers equipped with ICT and the management restricted computer labs for use by the computer department, but teachers from other schools sometimes used the computer labs as well. The participants stated that the ICT center as well as the Centre for Educational Technology (CET) was for general use.

The institution also has a virtual library that allows lecturers to use a smart board. In addition, all academic staff were given a laptop for office use. A participant further revealed that using ICT made his lesson on electronic concepts interesting and allowed him to make abstract concepts more concrete for students helped them understand the concepts better. Using ICT to teach also allowed him to get his students to understand concepts more quickly. He added that previously, before he had started to use ICT in his teaching, it had been difficult to get students to grasp these abstract concepts quickly (Hashim & Abubakar, 2017). Further a study of 814 faculty members in higher education in Turkey showed that majority of the respondents reported having access to computers and the internet. 82.5% and 81.2% of faculty members had access to computers and internet respectively (Usluel *et al*., 2008). These factors have led to the successful integration of ICT in the curriculum.

2.6.5 Leadership Factors

2.6.5.1 Administrative support

According to Anderson and Dexter (2005), leadership is one of the several critical strategies in the successful integration of ICT in education and training. Yee (2000) as cited by Tan (2010) believes that a leader who implements technology plans and also shares a common vision with the teachers stimulate them to use technology in their

lessons. Wong and Li (2008) conducted a study on factors that influenced transformational integration of ICT in eight schools in Hong Kong and Singapore. The study revealed that leadership promotion of collaboration and experimentation and teachers' dedication to student-centered learning influenced effective ICT transformation. In a quantitative study conducted by Ng (2008) on aspects of transformational leadership with 80 Singaporean secondary teachers, he found that a transformational leadership with qualities of identifying and articulating a vision, promoting acceptance of group goals, providing individualized support, offering intellectual stimulation, providing an appropriate model, creating high performance expectations, and strengthening school culture could influence the integration of ICT. Mead and Herd (2015) reports the following in the UNESCO World Report: The promise and potential of ICT in TVET, that practitioners' agencies report the critical success factor of commitment and leadership from institutional heads (EU, 2005; cinterfor, 2008; COL 20011). Without a Strong leadership which ensures inclusion of strategic objectives in planning processes, creates appropriate organized structure, supports the strengthening of ICT infrastructure and focuses on staff capacity building, ICT initiatives can't succeed. Further, CINTERFOR States in a study of ICT integration in TVET in Latin American countries, it was discovered that the new ICT has made it possible for knowledge in VTIs to be disseminated quickly but this has gotten a boost by the active interest shown by directors and heads of programs (CINTERFOR 2008:15)

2.6.5.2 Technical support

Similarly, Yilmaz, (2011) in assessing the technology integration processes in the Turkish education system reported that in providing schools with hardware and internet connections, it is also crucial to provide the schools with technical support

with regard to repair and maintenance for the continued use of ICT in schools. Jones (2004) as cited by Guma, Faruque and Khushi, (2013) reported that the breakdown of a computer causes interruptions and if there is lack of technical assistance, then it is likely that the regular repairs of the computer will not be carried out resulting in teachers not using computers in teaching. The effect is that teachers will be discouraged from using computers because of fear of equipment failure since no one would give them technical support in case there is technical problem.

Becta (2004) agreed that "if there is a lack of technical support available in a school, then it is likely that technical maintenance will not be carried out regularly, resulting in a higher risk of technical breakdowns". Neyland (2011) as cited by Saina *et al.* (2018) in assessing the technology integration processes in Turkish education system reported that in providing TVET institutions with ICT hardware and software ICT, it is also crucial to provide them with technical support such as repair and maintenance. Therefore, if there is no technical support for teachers, they become frustrated resulting in their unwillingness to use ICT (Tong & Trinidad, 2005).

2.6.6 Institutional Policy Factors

According to the oxford dictionary, a policy is a course or principle of action adopted or proposed by an organization or individual. An ICT policy plan is an essential management tool that can facilitate the successful implementation of ICTs (Kotsik *et al.*, 2009). ICT has been strongly admissible used in teaching and learning process in the world. In Sudan, despite the Federal Ministry of General Education FMGE policy plan encourages the use of ICT in the education sector to advance the education system as one of the state's sectors. Apart from the FMGE policy plan to integrate ICT in education sector still, there is no progression of ICT in general education.

A study was carried out to investigate the teachers' perceptions of ICT integration in TVET classes. Interviews used for collecting data from (10) teachers in Khartoum state. The results revealed that there is no clear ICT policy in education, the lack of physical, and ICT infrastructures, and lack of support in using ICT in TVET from the educational management. The findings imply that the government should increase efforts on ICT integration and also should involve various education stakeholder including teachers, the overall process of ICT integration in the TVET system. Additionally, international experiences are highly recommended to propose private ICT policy and, the modern digital learning materials might be equipped in TVET classrooms (Ramadan & Chen, 2018).

According to the UNESCO World Report, countries which have made the most progress with integrating ICT in TVET are those with the strongest national policies supported by funding resources and national programs. The success of integration of ICT in teaching and learning doesn't depend on the policy but on the thoroughness of implementation. An example is the Kenyan National ICT policy, it captures ICT ambitions of its citizens and cooperation's and it creates a framework for timely realization. As it's implemented with other government initiatives, it will create a prosperous, stable, globally competitive environment that is our joint national aspiration (Kenya national ICT policy, 2019). ACODE (2014) suggests eight benchmarks that are useful in judging the quality of Technology-enhanced learning among them is the institution-wide policy and governance (Sankey & Padró 2016).

Lauglo (2006), points to questions which he thinks research could address in order to provide guidance to the formulation of national development of policy on Technical and Vocational Education and Training (TVET). The questions are derived from what he sees as frequently "talked about" issues in international policy debate on TVET.

Research is used in a wide sense—not merely "academic" research. The issues includes: labour market monitoring, keeping abreast of technology, national training authorities, national training funds, national qualifications frameworks, financing, private institutions, modularization of curricula, human resource development, coping with management complexity, inducing industry to do more training, dual systems of basic TVET, low dosage TVET in mainstream secondary schools, TVET for illiterate and semi-literate adults, and indicators of performance that relate to effectiveness, equity, cost and efficiency. Especially in the early stages of policy formulation, research on such matters can provide relevant knowledge when major reorganization of TVET is considered by a country.

2.7 Summary and Gap in Literature

The above literature has revealed that most of the developed countries have made remarkable investment in the ICT sector as well as integrating ICTs in their education system characterized by well formulated ICT national policies, specific strategies of the use of ICTs in education and proper implementation, monitoring and evaluation.

On the other hand, the developing countries Kenya included are rapidly and heavily investing in ICTs despite the many other challenges they face for instance limited resources. Despite these efforts, the countries are still facing challenges such as low internet connectivity, inadequate power supply especially in the rural areas where most schools are located coupled with regular power interruptions, low number of computers compared to the high enrolment in schools. This creates a digital divide between the developed and the developing countries and thus the developing countries miss out on the benefits of ICT in almost all aspects including education which is the cornerstone of the economy and an avenue to break the poverty cycles in developing countries. The study was done to assess the factors that influence

integration of ICTs in teaching and learning in TVET institutions in Uasin Gishu County.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter will show the whole process on how the study was conducted systematically. It will include: research design, description of the study area, population of the study, sample size, sampling techniques, data collection tools, reliability and validity of the tools, data analysis and ethical considerations.

3.2 Research Design

Research design refers to the procedures selected by a researcher for studying a particular set of questions or hypothesis; this includes the researcher's choice of quantitative or qualitative methodology, and how, if at all, causal relationships between variables or phenomena are to be explored (Orodho, 2009).

Non-experimental descriptive survey design was used to establish the factors that are influencing integration of ICT in teaching and learning in TVET institutions in Uasin Gishu County. A survey is a method of collecting information by interviewing or administering a questionnaire to a sample of individuals.

The choice to pursue this type of methodology and design was motivated by previous research performing similar correlational analyses and asking research questions similar to the research question of this study. Non-experimental designs focus on observing and recording phenomena found within a sample or groups of samples of a population that is descriptive of the whole (Wilson, 2013). For the purpose of this study, the goal was to measure the correlation between factors and ICT integration that would represent a description of similar institutions.

3.3 Area of Study

The study was carried out at The Eldoret National Polytechnic and Rift Valley Technical Training Institute specifically at the Mechanical and Automotive Engineering Departments. The Eldoret National Polytechnic is located in Kapseret Sub-County while the Rift Valley Technical Training Institute is located in Ainabkoi Sub-County of Uasin Gishu County. The reason for selecting The Eldoret National Polytechnic and Rift Valley Technical Training Institute, despite the fact that there are numerous technical training institutions throughout the county, is that the institutions are well established, high number of student population, no similar study has been carried out in the setting, and studying all of them will be time consuming and very costly in terms of financial resources. These sampled institutions were representative of other institutions found in the county.

3.4 Target population

In this study, the target population consisted of 2053 trainees,53 trainers, 2 ICT technicians, 2 Heads of Departments, and the 2 principals of the two institutions. Also, a member of the governing council or board of management from each institution participated in this study.

3.5 Sample Size

Kothari (1985) defines sample size as "the number of items to be selected from the universe to constitute a sample." The sample sizes for the trainees, in this study was calculated using the Fisher's formula (2004) as cited by Mugenda and Mugenda (1999) for selecting the respondents. The formula was selected because is reliable, efficient and flexible and it ensures proper representation while all of the trainers and

technicians was used as the sample for this study because of their small numbers for reliability.

Fisher's formula for trainees

$n = z^2 pq/d^2$

Where n=minimum sample size to maximize precision of estimate

z=the standard normal deviate (1.96) which corresponds to 95% confidential level

p= proportion of trainees with defined characteristics under study at RVTTI AND TENP

q=1-p

d=degree of accuracy, 0.05

$n = (1.96)^2 (.50) (.50)/ (.050)^2$

n= 384

Table 3.1: Sample sizes for all strata of respondents

Respondents	Target Population		Sample Size	%
Trainees	RVTTI	784	192	24.5
	Eldoret NP	834	192	23
Trainers	RVTTI	22	22	100
	Eldoret NP	29	29	100
Administrators	RVTTI	2	2	100
	Eldoret NP	2	2	100
ICT Technicians	RVTTI	1	1	100
	Eldoret NP	1	1	100
Board/council members		21	2	10
Total		1691	438	25.9

Source: Field Data (2020)

3.6 Sampling Techniques

Kombo and Delno (2006) defined sampling as a procedure the researcher uses to gather people, places or things to study. This study used both stratified random sampling and purposive sampling. According to Kothari (1985), stratified random sampling is the type of sampling whereby the population doesn't consist of a homogenous group, the population is therefore stratified into subpopulations that are non-overlapping and then the sample required is randomly selected from these strata. This sampling technique was used to select samples from the following strata: trainers and trainees at the mechanical and automotive engineering departments of the two institutions.

Apart from the stratified random sampling, purposive sampling was also used in the study. According to Kothari (1985), purposive sampling involves the deliberate selection of a particular unit of the universe for constituting a sample which represents the universe. Purposive sampling was used to select ICT technicians, Heads of Departments, Principals at The Eldoret National Polytechnic and Rift Valley Technical Training Institute and a sitting member of the Board/Council in each institution.

3.7 Data Collection Tools

Both primary and secondary data was collected in this study. Data was collected using questionnaires and interview schedules. The researcher designed the questionnaires and interview schedules.

3.7.1 Primary Data Collection

3.7.1.1 Questionnaire

A questionnaire is a list of standard prepared to fit a certain inquiry (Mugenda, 2003). The study collected data with the use of questionnaires which enable the research to achieve the study's objectives on factors the influence integration of ICT. The questionnaires were used to collect data from the trainees, trainers and ICT technicians. The researcher designed a questionnaire that was used to collect relevant information from the respondents. The questions were both open-ended and close-ended.

3.7.1.2 Interview Schedule

Seale *et al*. (2004) define an interview as, the social encounter where speakers collaborate in producing retrospective and prospective accounts or version of their parts or future actions, experiences, feelings and thoughts. In this study, the researcher also designed an interview schedule for each category or respondents; the Heads of Department, the Principals and the Board/Council members.

3.7.2 Secondary Data collection

3.7.2.1 Document Analysis

Document analysis is a form of qualitative research in which documents are interpreted by the researcher to give voice and meaning around an assessment topic (Bowen, 2009) also according to Wikipedia, document analysis is a type of qualitative research in which documents are reviewed by the analysts to assess an appraisal theme. The researcher requested to be allowed to analyze written documents such time tables, schemes of work, departmental reports and inventories for computer

resources and teaching aids at the mechanical and automotive engineering departments.

3.8 Reliability and Validity

This section discusses reliability and validity which are very important to any study in a bid to collect accurate, reliable and valid data.

3.8.1 Validity

Validity is a measure of how well a test measures what it is supposed to measure (Kombo, 2006; Orodho, 2009; Mugenda, 1999). Validity is the degree to which results obtained actually represent the phenomenon under investigation. There are three types of validity: construct, content and criterion-related. Construct validity is measure of degree to which data obtained from an instrument meaningfully and accurately reflects or represents the theoretical concept.

Therefore, to access construct validity, there must exist a theoretical framework regarding the concept to be measured. If the measurements are consistent with theoretical expectations then the data has construct validity otherwise the data doesn't accurately represent the concept under study. Content validity is a measure of the degree to which data collected using a particular instrument represents a specific domain of content of a particular concept. The usual procedure in assessing content validity is to use experts in the particular field.

Lastly, criterion-related validity refers to the use of a measure in assessing subjects' behavior in specific situation. There are of two types: predictive and concurrent (Mugenda, 1999). Predictive validity refers to the degree which obtained data predict future behavior of subjects while concurrent validity refers to the degree to which data are able to predict behavior of subjects in the present (Mugenda, 1999). Validity was

established through close consultation and expert judgment of the supervisors; they verified the validity of the research instruments used in the study.

3.8.2 Reliability

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials (Mugenda, 1999). There are four methods of assessing reliability in data. They are the test-retest technique, equivalent-form, split-half and the internal consistency technique. In this study, the researcher used test-retest technique to test the reliability of instruments. The same data collection instrument was administered twice to the same group of subjects while keeping all the initial conditions constant within an interval of four weeks then the reliability correlation coefficient (r) was calculated using the spearman rank order.

Rho(r) =

Where: r = Spearman's coefficient of correlation.

d = difference between ranks of pairs of the two variables

n = the number of pairs of observation.

Also, a pilot study was conducted at Eldoret Technical Training Institute. ETTI was selected on the basis that they offer same courses in the mechanical and automotive engineering department as the two institutions under study. Apart from that, the students take the same exams from the Kenya national examination council and they also cover the same syllabus. A reliability index of 0.89 was obtained, the scores were checked against a 0.5 level of significance and therefore found to be reliable few corrections were made on the questions that were unclear and these were duly done. The aim of Pilot test is to assess the clarity of wording of the questionnaires and interview schedules. A pilot study is important in testing the validity of the instrument and clarity of language (Mugenda & Mugenda, 1999).

3.9 Data Analysis

Data was managed and analyzed using regression SPSS (Strata Corp 2009) and MS Excel software. This is a comprehensive, integrated collection of computer programs for managing, analyzing, and displaying data (Orodho, 2009). Data collected was analyzed through measures of frequencies and descriptive statistics. Data presentation was in form of frequency tables, bar graphs and pie charts. For qualitative data, a thematic strategy of data analysis was employed. Inferences were made objectively and systematically by identifying specific characteristics of text units, searching for emerging themes and teasing abnormalities.

3.10 Ethical Considerations

Ethical considerations are important for any research (Mugenda & Mugenda, 1999). The researcher observed acceptable etiquette when interacting with all the research respondents. The respondents were assured that the information they will provide will be handled confidentially and will only be used for academic purposes. The researcher asked for permission from the respondents to use their photographs and verbatim captions in this study. The board of postgraduate studies of University of Eldoret also acknowledged the research work as an academic project by issuing an introduction letter. NACOSTI issued a written research permit and at the end of the study, the researcher will send a copy of the research work to them.

3.11 Summary

From the above, the study will be systematic and the ethical considerations will be taken to ensure a smooth research work. The validity and reliability tests were carried out first and their results obtained before heading to the field for data collect. After

data collection, cleaning and coding were done, followed by analysis then interpretation and presentation data.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, INTERPRETATION AND DISCUSSION

4.1 Introduction

This chapter presents and analyzes the finding of the study. The present ratio and analysis of data is divided into two broad categories namely the demographic information of respondents and findings of each variable under study. This chapter groups data to correspond with the specific research objectives in relation to integration of ACT in teaching and learning as follows:

a) Demographic information of all the respondents

b) Human factors

c) Pedagogical factors

d) Curriculum factors

e) Availability of ICT infrastructure

f) Leadership factor

g) Institutional policy factor

4.2 Demographic Information of All the Respondents

4.2.1 Demographic Information of the Trainers

The responses that were given by the trainers in section b of their questionnaire has been tabulated in Table 4.1 which shows the frequency and percentage distribution of trainers by age, gender, working experience and their level of education.
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Table 4.1: Demographic Information of the Trainers

Demographic Information		Frequency	Percentage
Gender	Male	40	78.43
	Female	11	21.57
Age	25-30	4	7.84
	31-35	12	23.53
	36-40	19	37.25
	Above 40	15	29.41
Working experience			
	<5 years	16	31.37
	6-12 years	19	37.25
	Above 12 years	15	29.41
Level of education			
	PhD	2	3.92
	Masters	7	13.73
	Degree	38	74.51
	Diploma	4	7.84

According Table 4.1, 78.43% were male and 21.57% were female this revealed that both female and male were represented eliminating biasness of the finding. Further, the study sought to establish the respondents' working experience and it was found out that 31.37% had a working experience of less than five years, 37.25% had a working experience of between six and twelve years while 29.41% had a working experience of more than twelve years this implies that the respondents gave reliable response since, they have a working knowledge of the use of ICT in teaching and learning. In addition, the study revealed that 7.84% were between the age of twenty-five and thirty years, 23.53% were between thirty-one and thirty-five years, 37.25% were between thirty-six and forty years whereas 29.41% were above forty years of

age. The findings indicate that there was no biasness because of fair representation among all age brackets. Concerning the level of education, 37.25% were PhD holders, 13.73% had their Master's degree, 74.51% had Bachelor's degree while 7.84% had Diploma. This finding reveals that the respondents are well educated and were in the institution by merit.

4.2.2 Demographic Information of the Technicians

The responses that were given by the technicians to section b of their questionnaire tabulated in Table 4.2 which shows the frequency and percentage distribution of technicians by age, gender, working experience and their level of education.

Table 4.2: Demographic Information of the Technicians

Demographic Information		Frequency	Percentage
Gender	Male	2	100
	Female	Null	0
Age	20-25	Null	0
	26-30	null	0
	Above 30	2	100
Working experience			
	<5 years	null	0
	6-12 years	2	100
	Above 12	Null	0
years			
Level of education			
	PhD	Null	0
	Masters	Null	0
	Degree	null	0
	Diploma	2	100

All the technicians in the study were male, above 30 years of age, had a working experience of between six and twelve years and had a Diploma. This implies that they were competent and well experienced hence provided reliable information.

4.2.3 Demographic Information of the Trainees

The responses that were given by the trainees to section b of their questionnaire tabulated in the Table 4.3 which shows the frequency and percentage distribution of trainees by age, gender and year of study.

Table 4.3: Demographic Information of the Trainees

Demographic Information	Frequency	Percentage
Gender Male	262	69.68
Female	114	30.32
Age 20-25	338	89.89
26-30	23	6.11
Above 30	9	2.39
Year of Study 1st	204	54.26
2nd	98	26.06
3rd	74	19.68

According to Table 4.3, 69.68% were male and 30.32% were female this revealed that both female and male were represented eliminating biasness of the finding. Further, the study sought to establish the respondents' year of study and it was found out that 54.26% were first years, 26.06% were second years while 19.68% were third year students. In addition, the study revealed that 89.89% were between the age of twenty and twenty-five years, 6.11% were between twenty-six and thirty years whereas 2.39% were above thirty years of age. The findings indicate that there was no biasness because of fair representation

4.2.4 Demographic Information of the Principals

The responses that were given by the principals to section b of their questionnaire tabulated in Table 4.4 which shows the frequency and percentage distribution of principals by age, gender, working experience and their level of education.

Table 4.4: Demographic Information of the Principals

Demographic Information		Frequency	Percentage
Gender	Male	2	100
	Female	Null	0
Age	35-40	Null	0
	41-45	null	0
	Above 46	2	100
Working experience			
	<5 years	Null	0
	10-15 years	Null	0
	Above 16 years	2	100
Level of education			
	PhD	0	0
	Masters	2	100
	Degree	Null	0
	Diploma	Null	0

All the principals in the study were male, above forty-six years of age, had a working experience of above sixteen years and were Master's degree holders. This implies that they were competent hence were in the institution by merit and well experienced hence provided reliable information.

Table 4.5: Demographic Information of the members of the governing council/board

Demographic Information		Frequency	Percentage
Gender	Male	2	100
	Female	Null	0
Age	35-40	Null	0
	41-45	null	0
	Above 46	2	100
Working experience			
	<5 years	Null	0
	10-15 years	1	50
	Above 16 years	1	50
Level of education			
	PhD	0	0
	Masters	1	50
	Degree	1	50
	Diploma	Null	0

Members of the board of management in the study were male, above forty-six years of age, had a working experience of above ten years and one had a Master's degree and the other a bachelor's degree holder. This implies well experienced hence provided reliable information

4.3 Human Factors

The first objective of the study established human factors that affect ICT integration in teaching and learning IN TVET institutions. The human factors are; professional development, ICT competency, teaching experience and gender.

4.3.1 Professional Development

Trainers were asked if they have a Certificate Proficiency package in ICT, if ICT training at their former training institution was helpful, if they have attended in service training recently, and whether it was personally or institutionally organized. The response was as follows:

Table 4.6: Trainers perception on professional development

Statement		Yes	No
Do you have Certificate Proficiency packages in ICT?	F	39	12
	(%)	76.47	23.53
Can you say that ICT training at your former training institution has been helpful	F	14	37
	(%)	27.45	72.55
Have you attended any ICT in service training recently?	F	8	43
	(%)	15.69	84.31
Was it institutionally organized	F	0	8
	(%)	0	100

According to Table 4.6, the respondents were asked whether they have Certificate Proficiency packages in ICT and 76.47% had it while 23.53% didn't have it. This indicates that most the trainers had basic ICT training. They were also asked if ICT training at their former training institution has been helpful and 27.45% affirmed while 72.55% rejected it. This implies that most of the trainers gained little knowledge on ICT from their former training institutions. Concerning in service training, 15.69% were trained while 84.31% had no in service training. All the

trainers who had in service training had facilitated themselves. This indicates that none of the institution had facilitated in service training for their trainers. This is a contributing factor to the low ICT usage in teaching and learning in the TVET sector. These findings agree with the works of Junejo *et al*. (2018) that was conducted in Indonesia whose objective among others was to establish the perception of teachers on in-service training in Karachi region. The study revealed that in service training is crucial for improving teachers' efficiency. In addition, the findings of the study agree with studies conducted by Ahmad and Razali (2009) which established the relationship between in-service training with students' achievements at TVET institutions in Malaysia.

4.3.2 Trainers ICT Competency

The study sought to find out trainers ICT competency level. The trainers were asked if they could use learning applications for simulations and research, collaborative tools such as google drive, create podcasts and videocasts, use remote communication application, presentation packages and creating softcopy learning materials. The responses were as follows:

Table 4.7: Trainers use of ICT Applications

Statement	Frequency	Yes	No
Use of learning applications for simulations and research	F	13	38
	(%)	25.49	74.51
Use of collaborative tools such as google drive	F	6	45
	(%)	11.76	88.24
Create podcasts and videocasts for learners to access	F	2	49
	(%)	3.92	96.08
Use of remote communication application such as zoom	F	22	29
	(%)	43.13	56.86
Use of presentation packages	F	49	2
	(%)	96.08	3.92
Creating softcopy learning materials and disseminating them	F	51	0
	(%)	100	0

From Table 4.7, it can be deduced that 25.49% of trainers could use of learning applications for simulations and research while 74.51% were unable to use it. 11.76% could make use of collaborative tools such as google drive while 88.24% were unable to use it. 3.92% could create podcasts and videocasts for learners to access while 96.08% were unable to do it. 43.13% could use of remote communication application such as zoom while 56.86% could not use it. 96.08% of the trainers could use of presentation packages while 3.92% were not conversant with it.

These findings indicate that the trainer's ICT competency is wanting as they are mostly competent in the most basic skills. This is a contributing factor to the low usage of ICT in teaching and learning in TVET institutes. The findings of this study

agree with research conducted by Cuckle *et al*. (2000) which found teachers to be most competent in word processing compared to other applications.

4.3.3 Teaching Experience and Gender

The study sought to find out trainers teaching experience and gender in relation to use of ICTs in teaching. The following response was obtained:

Table 4.8: Trainers' Perception

Demographic Information			Yes	No
Gender	Male	F	13	26
		%	32.50	65.00
	Female	F	2	9
		%	18.18	81.81
Working experience				
	<5 years	F	14	2
		%	87.50	12.50
	6-12 years	F	7	12
		%	36.84	63.16
	Above 12 Years	F	1	14
		%	6.67	93.33

The findings in Table 4.8 concerning teaching experience reveal that 87.50% of trainers with a working experience of less than 5 years embraced use of ICT in teaching while 12.5% didn't use ICT in teaching. 36.84% of trainers with a working experience of between six and twelve years embraced use of ICT while 63.16% did not use technology to teach. 6.67% the most experienced trainers use ICT to teach while 93.33% while did not use technology in teaching. This indicates that younger trainers embraced use of ICT more than the experienced trainers. Kushnir *et al*. (2014) agree with this finding. It reveals that school teachers of the future are coming

from a new generation. This generation is fluent and even unseparated from digital devices. As representatives of a new culture, future school teachers should play a major of implementing ICT in education. Thus, future teachers should be ready to develop new approaches in education and help other teachers of older generations to take advantages of technology. University educators and the authors of ICT policies should provide opportunities for future teachers to communicate with their older colleagues as peers and form their ability to discuss practical issues about ICT in Education.

Concerning gender, the findings reveal that 32.50% of the male trainers use ICT teaching while 65% don't make use of it. 18.18% of female trainers while 81.81% don't make use of ICT. This implies more male trainers use ICT as compared to their female counterparts this is in agreement with Burnett, Finger and Watson (2006) conducted a study on teachers' integration of ICT in schools in Queensland State. Results from 929 teachers indicated that female teachers were integrating technology into their teaching less than the male teachers.

4.4 Pedagogical Factors

Trainers were asked whether they use ICT-appropriate teaching methods and if they were pedagogically ready to integrate ICT in teaching and learning. The responses were as follows;

4.4.1 Trainers' Perception

Table 4.9: Trainers perception

Statement		Yes	No
Do you use ICT-appropriate teaching methods?	F	18	33
	(%)	35.29	64.71
Can you say that you're pedagogically ready to integrate ICT in teaching and learning?	F	16	35
	(%)	31.37	68.63

From Table 4.9, the findings reveal that 35.29% of trainers use ICT-appropriate teaching methods while 64.71% didn't use ICT-appropriate teaching methods. 31.37% were pedagogically ready to integrate ICT in teaching and learning while 68.63% were not ready to integrate ICT in teaching and learning. They alluded it to lack of in-service training, inadequate resources and inadequate training in their former training institutions.

These finding agrees with a study conducted in Canada that explored the obstacles to ICT integration in the Canadian classroom. This study revealed that teachers in many schools struggle to integrate ICT as part of their teaching practice due to gaps in ICT knowledge and skills, lack of training and inadequate support and inability to translate training into pedagogical practice among other challenges (Saxena, 2017).

4.4.2 Trainees' Perception

Trainees were asked if their trainers used the following technology in teaching, their responses were as follows 12.23% agreed that their trainers use learning applications for simulations and research, 6.38% agreed that their trainers use collaborative tools,

99.47% did not agree that their trainers create podcasts and videocasts for learners to access, 20.48% of the trainees revealed that their trainers make use of remote communication, 98.67% and 99.47% agreed that their trainers use presentation software and softcopy materials to teach respectively. This is in agreement with the trainers view on ICT competency. The trainee's response implied that trainers are not pedagogically ready to use ICT in teaching and learning this agrees with Turgut & Aslan (2021) that found out that the ICT and pedagogy competence of teachers among other factors greatly affects ICT integration.

Table 4.10: Use of technology in Teaching

Statement		Yes	No
Use of learning applications for simulations and research	F	46	330
	(%)	12.23	87.77
Use of collaborative tools such as google drive	F	24	352
	(%)	6.38	93.62
Create podcasts and videocasts for learners to access	F	2	374
	(%)	0.53	99.47
Use of remote communication application such as zoom	F	77	299
	(%)	20.48	79.52
Use of presentation packages	F	371	5
	(%)	98.67	1.33
Creating softcopy learning materials and disseminating them	F	374	2
	(%)	0.53	99.47

4.5 Curriculum Factors

4.5.1 Trainers' Perception

Table 4.11: Trainers' Perception on Curriculum Factors

Statement	F	(%)
How many teaching hours do you have per week?	8	15.69
2 - 8Hrs.	14	27.45
10 - 20Hrs.	22	43.14
22 - 30Hrs.	7	13.73
Above 30 Hrs.		

These findings reveal that trainers have a significant workload. 15.69% had 2 to 8 hours weekly, 27.45% of trainers had between 10 to 20 hours weekly, 43.14% had an average of 6 hours daily of which its quite strenuous for any individual. Few trainers have lesser hours daily because they have other departmental or institutional responsibilities such as timetablers, exam officers, quality assurance officers among others. An interview with the administrators agreed with trainers that they are overstretched with huge workload. This strain on trainers has made it difficult to use ICT in teaching and learning process because it requires time for preparation processes such as research and content development.

Table 4.12: Curriculum Factors Affecting Integration of ICT in the Teaching and Learning Process

Factor		SA	A	U	D	SD
Lack of enough time to research and prepare digital materials for the class	F	8	38	3	2	0
	(%)	15.69	74.51	5.88	3.92	0
Inadequate scheduled time and opportunities to interact and share experience of rising new technologies with peers	F	11	42	7	1	0
	(%)	21.57	82.35	13.73	1.96	0
Lack of time for training and exchange ideas with experts on how to use new technologies	F	9	35	2	3	1
	(%)	17.63	68.63	3.92	5.88	1.96

An analysis of Table 4.12 shows that 74.51% agree that they lack enough time to research and prepare digital materials for the class, 15.69% strongly agree, 5.88% are undecided while 3.92% disagree. In regard to scheduled time and opportunities to interact and share experience of rising new technologies with peers 21.57% strongly agree, 82.35% agree, 13.73% are undecided and 1.96% strongly disagree. The study also asked respondents to rate the lack of time for training and exchange ideas with experts on how to use new technologies, 17.63% strongly agree, 68.63% agree, 3.92% were undecided, 5.88% disagreed while 1.96% strongly disagreed. The findings indicate that trainers were straining due to a heavy workload both in class and administrative responsibilities hence making it difficult to integrate ICT in the teaching and learning process. This finding agrees with the study conducted by Kale and Goh (2014) that found out that teacher's workload and a structured and standardized curriculum were inhibitors of Web 2.0 adoption.

4.6 ICT Infrastructure Factors

The study sought to find out the availability of computer, network and power resources. The following was established from the technicians in charge;

Table 4.13: Infrastructure Factor Affecting Integration of ICT in the Teaching and Learning process

Statement	F (%)
Computers at HOD's Office	
less than 2	100
more than 2	0
Trainers Parlor	
less than 5	100
more than 5	0
Secretaries desk	
less than 2	100
more than 2	0
Computer Lab	
less than 15	0
more than 15	100
Number of projectors at the Department?	
less than 2	100
more than 2	0
How often do you purchase software at the Department?	
Monthly	0
Termly	0
Annually	100
Rate your internet speed	
Slow	100
Medium	0
Fast	0

A close analysis of Table 4.13 reveals that the head of department office has less than two computers so as the secretary's desks. The trainer's parlor has less than five computers while the departmental computer laboratory has more than fifteen computers in both institutions. Both institutions purchase software annually and they have less than two projectors in the mechanical and automotive engineering department. In relation to the trainees and trainer population, it can be deduced that ICT resources are inadequate. It was also noted that the departmental computer laboratory is fully occupied by learners during working hours hence no time to make use of the computers also no learning software has been made available by the institutions.

Table 4.14: Access to a Stable and Regular Power Supply

Statement	Yes	No
	F (%)	F (%)
Do you have access to a stable and regular power supply?	100	0
Do you oftenly have power black outs in the institution?	0	100
Do you have a power backup plan?	50	50

Technicians also noted that both institutions have access to a stable and regular power supply, they don't oftenly have power black outs in the institution and on the few occasions of blackout only one institution has a power back up plan in form of a generator. In addition, they have internet connection that is accessed through WIFI and Ethernet cable though its slow and unreliable hence demotivating trainers in

research and content development for teaching and learning. The same sentiments were echoed by trainees. One technician noted that there was a single projector at the department that has to be shared with other departments; this makes it difficult to share the resource.

An interview with the principals further revealed that limited financial resources and high trainee enrollment has contributed to the inadequacy in ICT infrastructure. From the above analysis, it can be deduced that limited ICT resources is a barrier to the integration of ICT in teaching and learning.

These findings agree with a survey carried out in South Africa which found out that teachers are uncertain with respect to the enforcement of e-education while being encumbered by poor infrastructure and lack of skills (Padayachee, 2017). Bingimlas, (2009), also noted that lack of confidence, lack of competence, and lack of access to resources are inhibiting factors in ICT integration.

4.7 Leadership Factors

The respondents were tasked in order for the researcher to establish if the administration supported them and whether trainers had adequate technical support, the following was the response obtained;

4.7.1 Administrative support

Table 4.15: Trainers perspective

Factor	SA	A	U	D	SD
Integration of ICT in teaching and learning is a shared vision between the administration and trainers	0 0	1 1.96	0 0	46 90.20	4 7.84
The administration provides individual trainers with support for integration of ICT in teaching and learning	0 0	0 0	0 0	48 94.12	3 5.88
The administration provides regular in-service training for trainers for effective integration of ICT in teaching and learning	0 0	0 0	0 0	51 100	0 0
The administration provides regular motivation and incentives for integration of ICT in teaching and learning.	0 0	0 0	0 0	46 90.20	4 7.84
The administration regularly monitors and evaluates the integration of ICT in teaching and learning.	0 0	0 0	0 0	45 88.24	6 11.76

Table 4.15 reveals that the trainers disagreed that Integration of ICT in teaching and learning is a shared vision between the administration and trainers, the administration provides individual trainers with support for integration of ICT in teaching and learning, the administration provides regular in-service training for trainers for effective integration of ICT in teaching and learning, the administration provides regular motivation and incentives for integration of ICT in teaching and learning and that the administration regularly monitors and evaluates the integration of ICT in teaching and learning. Lack of support from the administration has led to the low usage of technology in teaching.

4.7.2 Technical Support

Table 4.16: Technicians' Perspective

Factor	SA	A	U	D	SD
Too much work and you are overstretched	0	100	0	0	0
The administration provides all the required software and hardware	0	0	0	100	0
The administration provides regular in-service training	0	0	0	100	0
The administration provides regular motivation and incentives	0	0	0	50	50

The technicians revealed that they are overstretched; the administration did not provide all the required software and hardware, regular in-service training and motivation and incentives. This made it difficult for them to support trainers in using ICT for teaching and learning processes.

The administrators agreed in unison that the technicians were inadequate, finances to provides all the required software and hardware, provide in service training and motivation was insufficient.

The findings agree with Bingimlas (2009) who established barriers to ICT integration. He states that teachers should be provided with technical support for excellent integration of ICT in learning and teaching opportunities.

4.8 Institutional Policy Factors

The trainers, HOD's and the principals were asked whether they have an ICT policy, if they were conversant with the contents of the policy also the review process. The following data was obtained:

Table 4.17: Trainers' Perception

Statement	Yes		No	
	F	F (%)	F	F (%)
Does your institution have an ICT policy?	15	29.41	36	70.59
If yes, are you conversant with the contents in that document	6	40	9	60
I was involved in either developing or reviewing the existing ICT policy	1	1.96	50	0.98

The findings in Table 4.17 reveal that 70.59% were not aware of the existence of an ICT policy within the institution while 29.41% were aware of its existence. 40% of trainers were conversant with the content of the ICT policy while 60% were not conversant with the content. Only one trainer was involved in either developing or reviewing the existing ICT policy. This implies that trainers were not ready to use ICT in teaching and learning because most of them had no clue of its existence and those aware of it, majority were not conversant with the content. For its implementation to be successful, it has to be a shared vision among all stakeholders.

Table 4.18: Administrators' Perception

Statement		HoD		Principal	
		Yes	No	Yes	No
Does your institution have	F	2	0	2	0
an ICT policy?	(%)	100	0	100	0
Is a shared vision with all	F	0	2	0	2
members of staff	(%)	0	100	0	100
Has it been recently	F	0	2	0	2
reviewed with the relevant	(%)	0	100	0	100
stakeholders					

The principals and Heads of Departments were fully aware of the existence of an ICT policy however it's not a shared vision because they stated that they had never had a forum to discuss or evaluate the policy with the trainers and relevant stakeholders. It was also noted that no recent reviews had been made on the policy. This indicates that the policy had not implemented in the institutions hence no follow up on trainers to integrate ICT in teaching and learning processes.

Kotsik *et al*. (2009) noted that an ICT policy plan is an essential management tool that can facilitate the successful implementation of ICTs in TVET. Kibata (2013) also established that a policy framework be developed to guide teachers on the implementation of flexible and blended approaches in the teaching and learning practice in TVET institutions.

CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter covers the summary of the findings based on the objectives, conclusion, recommendation and suggestions for further research. The study sought to establish the integration of ICT in teaching and learning in TVET institutions in the mechanical and automotive engineering departments in Uasin Gishu County.

5.2 Summary of the Findings

5.2.1 Human Factors

The study found that the trainers had basic ICT training. 27.45% affirmed that ICT training at their former training institution has been helpful in the integration of ICT in teaching and learning while the majority 72.55% rejected it. This implies that most of the trainers gained little knowledge on ICT from their former training institutions. Concerning in service training, 15.69% were trained while 84.31% didn't receive any in service training. All the trainers who had in service training had facilitated themselves. This indicates that none of the institution had facilitated in service training for the trainers. This is a contributing factor to the low ICT usage in teaching and learning in the TVET sector.

Concerning gender, the findings reveal that 32.50% of the male trainers use ICT teaching while 65% don't make use of it. 18.18% of female trainers while 81.81% don't make use of ICT. This implies that more male trainers integrate ICT in teaching and learning than their female counterparts.

5.2.2 Pedagogical Factors

The study results revealed that 31.37% were pedagogically ready to integrate ICT in teaching and learning while 68.63% were not ready to integrate ICT in teaching and learning. They alluded this to lack of in-service training, inadequate resources and inadequate training in their former training institutions. Trainers should be equipped through training and availing of resources so that they can be ready to integrate ICT in teaching and learning.

Majority were neutral that trainers create podcasts and videocasts for learners to access, 20.48% of the trainees revealed that their trainers make use of remote communication, 98.67% and 99.47% agreed that their trainers use presentation software and softcopy materials to teach respectively. This is in agreement with the trainers view on ICT competency.

5.2.3 Curriculum Factors

The findings in relation to curriculum factors revealed that 43.14% had an average of 6 hours daily of which it's quite strenuous for any individual. Few trainers have lesser hours daily because they have other departmental or institutional responsibilities such as timetables, exam officers, quality assurance officers among others. This strain on trainers has made it difficult to use ICT in teaching and learning process because it requires time for preparation processes such as research and content development.

In regard to scheduled time and opportunities to interact and share experience of new technologies with peers 82.35% agree while 1.96% strongly disagree that they have scheduled time and opportunities to interact and share experience of new technologies. In relation to lack of time for training and exchange ideas with experts on how to use new technologies, 68.63% agree, while the minority 1.96% strongly disagreed

The findings indicate that trainers were straining due to a heavy workload both in class and administrative responsibilities hence making it difficult to integrate ICT in the teaching and learning process.

5.2.4 ICT Infrastructure Factors

The findings in relation to ICT infrastructural factors revealed that there's inadequate computer resources in the department that facilitates teaching and learning in the classroom. It was noted that internet speed is wanting, and there's no power backup. This hinders effective use of ICTs in teaching and learning.

5.2.5 Leadership Factors

The findings in relation to leadership factors reveals that trainers disagreed that integration of ICT in teaching and learning is a shared vision between the administration and trainers. The administration doesn't provide individual trainers with support for integration of ICT in teaching and learning hence there's limited integration of ICT in teaching and learning.

5.2.6 Institutional Policy Factors

The study findings revealed that 40% of trainers were conversant with the content of the ICT policy while 60% were not conversant with the contents of the ICT policy. Only one trainer was involved in either developing or reviewing the existing ICT policy. This implies that trainers were not ready to use ICT in teaching and learning because most of them had no clue of its existence and those aware of it, majority was not conversant with the content. For its implementation to be successful, it has to be a shared vision among all stakeholders. Trainers should be involved in the Development

and review the ICT policy in order for them to understand and appreciate its contents hence commit to integration of ICT in teaching and learning.

5.3 Conclusion

The major finding in this study is that there's limited integration of ICT in the teaching and learning process due to the following reasons as discussed below.

Based on the first objective on human factors, the study found trainers lacked in-service training, were competent in the most basic ICT skills, more younger trainers integrate ICT   in the teaching and learning process than the older trainers also more male trainers use ICT as compared to their female counterparts .

The study also found that trainers were not pedagogically ready to use ICT in teaching and learning.

Concerning the curriculum factors, trainers have a huge workload plus other responsibilities that resulted into lack of enough time to research and prepare digital content, interact and share experiences with colleagues also time for training on the integration ICT in teaching and learning.

In relation to the availability of ICT infrastructure factor, it can be deduced that ICT resources are inadequate. It was also noted that the departmental computer laboratory is fully occupied on trainers working day hence no time to make use of the computers also no learning software has been made available by the institutions. It can also be noted that there's no power back up plan and the internet is slow. An interview with the principals further revealed that limited financial resources and high trainee enrollment has contributed to the inadequacy in ICT infrastructure. From the above

analysis, it can be deduced that limited ICT resources is a barrier to the integration of ICT in teaching and learning.

The administration neither provides regular in-service training for trainers and regular motivation and incentives for integration of ICT in teaching and learning also they rarely monitor and evaluate the integration of ICT in teaching and learning this lack of support from the administration has led to the low usage of technology in teaching.

In relation to institutional policy factors, the study found that most trainers had no clue of the existence of an ICT policy and those aware of it, majority were not conversant with the content. For its implementation to be successful, it has to be a shared vision among all stakeholders. This indicates that the policy had not implemented in the institutions hence no follow up on trainers to integrate ICT in teaching and learning processes.

5.4 Recommendations

Based on the research findings and the discussion, the study formulated recommendations for sustainable ICT use for instructions in these institutions. These were:

   i.   TVET institutions and the government under the public service commission should provide regular in-service training for trainers and technicians in order to improve their skills as technology is a highly dynamic field.

   ii. TVET institutions and the public service commission should work on increasing human resource especially the trainers in order to reduce trainer's workload hence giving them more time to prepare and integrate ICT in the teaching process.

iii.   TVET institutions in partnership with stakeholders both in the public and private sector should make adequate provision for computer resources to trainers and trainees for ICT integration.

iv.   TVET institutions should provide trainer with motivation such as incentives and awards for trainers who use ICT in teaching this will in turn motivate trainers hence more use of ICTs.

v.   TVET institutions should make a provision for more technicians in order to provide technical support more effectively so as trainers can make more use of ICT in teaching.

vi.   TVET institutions should include all stakeholders both within and without in the policy making and reviewing process

5.5 Suggestions for Further Research

The study suggests the following:

i.   There is necessity for similar research to be undertaken on a wider perspective to allow for the generalization of the research outcomes.

ii.   There is need to undertake a study to ascertain the positive influence of the use of ICTs in the teaching and learning process.

iii.   There is need to assess the impact of ICT integration for instruction on TVET education.

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APPENDICES

Appendix I: Letter of Introduction

MERCY NDIWA

P.O BOX 3717,

KITALE.

20.07.2020

COUNTY COMMISSIONER

UASIN GISHU COUNTY

P.O BOX 200

Dear Sir/Madam

RE: **REQUEST FOR DATA COLLECTION**

Am Mercy Ndiwa a student at the University of Eldoret taking Master of Education in Technology Education (Computer Studies Option). I am requesting to carry out research on Integration of ICT in Teaching and Learning in TVET Institutions in Uasin Gishu County. Am requesting for permission to collect data which will be strictly used for academic purpose. A copy of the findings will be submitted to your office.

Yours Sincerely

_____

MERCY NDIWA

0707244336

Appendix II: Budget for the Study

S/No	Item	Cost (Kshs)
1	Equipment	30,000
2	Transport	20,000
3	Accommodation	30,000
4	Internet Services	10,000
5	Stationary	10,000
6	Printing and Binding Cost	10,000
7	Miscellaneous	10,000
	Total Cost	**120,000**

Appendix III: Questionnaire for Trainers

Introduction

The researcher is carrying out research on factors affecting the integration of ICT in teaching and learning TVET institutes in Uasin Gishu County. Please don't write your name on the questionnaire. Answer the questions objectively and provide accurate information to the best of your knowledge. Use a tick ($\sqrt{}$) to show your response where applicable, response can also be written. Your participation is voluntary, but we hope you will participate since your views are important. Kindly, if you have any questions you can seek clarification

Section One: Part A

General Information		
1.	Sub-county	
2.	Name of institution	
3.	Phone number (optional)	

Section One: Part B

Demographic Information of Trainers		
1.	Gender of the respondent	F ( ) M ( )
2.	What is your current age in years	
3.	How long have you been teaching in the TVET sector	3 years and below ( ) 5-10 years ( ) 10-15 years ( ) Above 16 years ( )
4.	What is your highest educational qualification	PGDE ( )

		Diploma ( )
		Degree ( )
		Masters ( )
		PhD ( )

Section Two: Human Factors

1. What is the level of ICT training?

   Certificate Proficiency packages ( )

   Diploma in ICT ( )

2. Have you attended any ICT training recently?

   Yes ( )   No ( )

3. If yes, was it personal or institutionally organized?

   Personal ( )   institutionally organized ( )

4. How many of the following ICT related competencies do you possess

   o Use of presentation packages

   o Use of collaborative tools such as google drive

   o Creating podcasts and video casts for learners to access

   o Use of internet tools such as zoom for remote teaching and learning

   o Creating softcopy learning materials such as PDFs and disseminating them

Section Three: Pedagogic factors

1. Do you use ICT-appropriate teaching methods

   Yes ( )   No ( )

2.   If yes, which ones in particular

   i.   ……………..
   ii.   ……………..
   iii.   ……………..

3. Can you say that you're pedagogically ready to integrate ICT in teaching and learning

   Yes ( )   No ( )

4. If yes, state reasons why

    i.   ……………..

    ii.   ……………..

    iii.   ……………..

Section Four: Curriculum Factors

1. How many teaching hours do you have per week?

   2 - 8Hrs. ( )   10 - 20Hrs. ( )   22 - 30Hrs. ( )   Above 30 Hrs. ( )

2. How many teaching hours do you have per day?

   2- 4Hrs. ( )   6 - 10Hrs. ( )   Above 10 Hrs. ( )

3. Indicate the extent to which you agree with the following statements. **SA-Strongly agree, A- Agree, U- Uncertain, D-Disagree, SD- strongly disagree**

	Factor	SA	A	U	D	SD
a.	Lack of enough time to research and prepare digital materials for the class					
b.	Inadequate scheduled time and opportunities to interact and share experience of rising new technologies with peers					
c.	Lack of time for training and exchange ideas with experts on how to use new technologies					

Section five: Leadership Factors

1. How many ICT technicians service the Mechanical and Automotive Department?

   Less than 2 ( )   more than 2 ( )

2. How often do the ICT technicians attend in-service training?

   Termly ( )   Yearly ( )   No training ( )

3. Indicate to what extent the following technical support factors influence integration of ICT in teaching and learning. **SA-Strongly agree, A- Agree, U- Uncertain, D- Disagree, SD- strongly disagree**

	Factor	SA	A	U	D	SD
a.	Lack of technician to help teachers with the computer hardware or the software					
b.	High cost of computer maintenance and Upgrading					
c.	High cost of staff training on computer Maintenance					
d.	Fear of computer and technology breakdown during teaching process					
e.	Frequent breakdown of computer and other digital equipment					

4. Indicate to what extent the following administrative support factors influence integration of ICT in teaching and learning. **SA-Strongly agree, A- Agree, U-Uncertain, D- Disagree, SD- strongly disagree**

	Factor	SA	A	U	D	SD
a.	Integration of ICT in teaching and learning is a shared vision between the administration and trainers					
b.	The administration provides individual trainers with support for integration of ICT in teaching and learning					
c.	The administration provides regular in-service training for trainers for effective integration of ICT in teaching and learning					
d.	The administration provides regular motivation and incentives for integration of ICT in teaching and learning.					
e.	The administration regularly monitors and evaluates the integration of ICT in teaching and learning.					

Section Six: Institutional Policy Factors

1. Does your institution have an ICT policy?

   Yes ( ) No ( )

2. If yes, are you conversant with the contents in that document

   Yes ( ) No ( )

3. Indicate the extent to which you agree with the following statements **SA-Strongly agree, A- Agree, U- Uncertain, D-Disagree, SD- strongly disagree**

	Factor	SA	A	U	D	SD
a.	The ICT policy has been fully implemented in the institution					
b.	The ICT policy has been reviewed periodically					
c.	I was involved in either developing or reviewing the existing ICT policy					

Thank You

Appendix IV: Questionnaire for ICT Technicians

Introduction

The researcher is carrying out research on factors affecting the integration of ICT in teaching and learning TVET institutes in Uasin Gishu County. Please don't write your name on the questionnaire. Answer the questions objectively and provide accurate information to the best of your knowledge. Use a tick ($\sqrt{}$) to show your response where applicable, response can also be written. Your participation is voluntary, but we hope you will participate since your views are important. Kindly, if you have any questions you can seek clarification

<div align="center">

Section One: Part A

</div>

General Information		
1.	Sub-county	
2.	Name of institution	
3.	Phone number (optional)	

<div align="center">

Section One: Part B

</div>

Demographic Information of ICT Technicians		
1.	Gender of the respondent	F ( ) M ( )
2.	What is your current age in years	
3.	How long have you been working in the TVET sector	3 years and below ( ) 5-10 years ( ) 10-15 years ( ) Above 16 years ( )
4.	What is your highest educational qualification	Certificate ( ) Diploma ( )

		Degree ( )
		Masters ( )
		PhD ( )
5.	What course did you study for your above (question 4) qualification	ICT -related ( )
		Others ( )

Section Two: ICT Infrastructure Factors

1. How many computers do you have at the Mechanical and Automotive Department?

   5 – 10 ( ) 11 – 15 ( ) 16 – 20 ( ) Above 21 ( )

2. How many computers located in the following areas at the department

   a. HOD's Office   less than 2 ( )   more than 2 ( )

   b. Trainers Parlor   less than 5 ( )   more than 5 ( )

   c. Secretaries desk   less than 2 ( )   more than 2 ( )

   d. Computer Lab   less than 15 ( )   more than 15 ( )

   e. How many projectors do you have at the Mechanical and Automotive Department?

   Less than 2 ( ) More than 2 ( )

   f. Do you have access to a stable and regular power supply?

      Yes ( )   No ( )

   g. How often do you have power black outs in the institution?

   Oftenly ( )   Rarely ( )

   h. Do you have a power backup plan

   Yes ( )   No ( )

   i. If yes, which one in particular

   Solar ( )   Generator ( )

   j. Do you have internet connection in your institution?

   Yes ( )   No ( )

   k. If yes, how do you access the internet

   Ethernet cable ( )   WIFI ( )

   l. How can you rate your internet connectivity speed   Fast ( )   Medium ( )   Slow ( )

m. List down software you have access to for use to developing digital learning materials

n. How often do you update software at the Mechanical and Automotive Department?

Weekly ( ) Monthly ( ) Termly ( ) Annually ( )

Section Six: Leadership Factors

1. How many ICT technicians service the Mechanical and Automotive Department?

    Less than 2 ( )   more than 2 ( )

2. How often are you facilitated to attend in-service training?

    Termly ( )   Yearly ( )   No training ( )

3. Indicate to what extent the following technical support factors influence integration of ICT in teaching and learning. **SA-Strongly agree, A- Agree, U- Uncertain, D- Disagree, SD- strongly disagree**

	Factor	SA	A	U	D	SD
a.	You have too much work and you're over stretched					
b.	High cost of computer maintenance and Upgrading					
c.	Institution takes long to finance maintenance and upgrading of hardware and software					
d.	Institution takes long to purchase and upgrade computer resources					

Thank You

Appendix V: Questionnaire for Trainees

Introduction

The researcher is carrying out research on factors affecting the integration of ICT in teaching and learning TVET institutes in Uasin Gishu County. Please don't mention your name on the questionnaire. Answer the questions objectively and provide accurate information to the best of your knowledge. Use a tick (√) to show your response where applicable, response can also be written. Your participation is voluntary, but we hope you will participate since your views are important. Kindly, if you have any questions you can seek clarification

<div align="center">Section One: Part A</div>

General Information	
1. Sub-county	
2. Name of institution	
3. Phone number (optional)	

<div align="center">Section One: Part B</div>

Demographic Information of Trainers	
1. Gender of the respondent	F ( ) M ( )
2. What is your current age in years	
3. Which year of study are you currently in	1st ( ) 2nd ( ) 3rd ( )

Section Three: Pedagogic Factors

1. How often do your trainers use ICT-appropriate teaching methods?

   Often ( )   Rare ( )

2.   If yes, which ones in particular

      i.   ……………..

      ii.   ……………..

      iii.   ……………..

3.   Can you say that your trainers are ready to use ICT in teaching and learning?

      Yes ( )   No ( )

If yes, state reasons why

……………..

……………..

……………..

Section Six: ICT Infrastructure Factors

1.   Do you have access to a stable and regular power supply?

    Yes ( )   No ( )

2.   How often do you have power black outs in the institution?

    Often ( )   Rarely ( )

3.   Do you have a power backup plan?

    Yes ( )   No ( )

4.   If yes, which one in particular

    Solar ( )   Generator ( )

5.   Do you have internet connection in your institution?

    Yes ( )   No ( )

6.   If yes, how do you access the internet

    Ethernet cable ( )   WIFI ( )

7.   How can you rate your internet connectivity speed?

    Fast ( )   Medium ( )   Slow ( )

Thank You

Appendix VI: Interview Schedule for Heads of Departments

Interview Schedule

Name

Place

Date

Time

Respondent Profile

Name

Age

Gender

Male ☐ Female ☐

Highest Level of Education

Certificate ( ) Diploma ( ) Degree ( ) Masters ( ) PhD ( )

Specific questions on Integration of ICT

1. Does your institution have ICT policy and plan? Yes ( )   No ( )
2. How many computers do you have in your institution for trainers to use in developing digital learning material?
3. How did you acquire them?
4. Is your institution connected to the internet?
5. What is the main use of the internet?
6. What is the estimate budget of ICT in your institution and how do you finance the budget?
7. How often do you offer in service training for your teaching staff?
   a.   Monthly ( )   Termly ( )   Annually ( )

8. Do you believe that trainers are motivated adequately to use ICT in teaching and learning

9. Do you think trainer's work load has an influence in the use of technologies in teaching and learning? If yes, how

10. How many ICT technicians do you have in the department? Do you think they are adequate?

11. How many trainers have been allocated computers to develop digital learning material?

12. What has the government done through the state department of TVET done to support integration of ICT in teaching and learning process in your department?

Thank You

Appendix VII: Interview Schedule for Principals

Interview Schedule

Name

Place

Date

Time

Respondent Profile

Name

Age

Gender

Male ☐   Female ☐

Highest Level of Education

Certificate ( ) Diploma ( ) Degree ( ) Masters ( ) PhD ( )

Specific questions on Integration of ICT

13. Does your institution have ICT policy and plan? Yes ( )   No ( )

14. How many computers do you have in your institution for trainers to use in developing digital learning material?

15. How did you acquire them?

16. Is your institution connected to the internet?

17. What is the main use of the internet?

18. What is the estimate budget of ICT in your institution and how do you finance the budget?

19. How often do you offer in service training for your teaching staff?

    Monthly ( )   Termly ( )   Annually ( )

20. Do you believe that trainers are motivated adequately to use ICT in teaching and learning

21. Do you think trainer's work load has an influence in the use of technologies in teaching and learning? If yes, how

22. How many ICT technicians do you have in the department? Do you think they are adequate?

23. How many trainers have been allocated computers to develop digital learning material?

24. What has the government done through the state department of TVET done to support integration of ICT in teaching and learning process in your department?

Thank You

Appendix VIII: Interview Schedule for Council/Board Member

Interview Schedule

Name

Place

Date

Time

Respondent Profile

Name

Age

Gender

Male ☐   Female ☐

Highest Level of Education

Certificate ( ) Diploma ( ) Degree ( ) Masters ( ) PhD ( )

Specific questions on Integration of ICT

1. Does your institution have ICT policy and plan? Yes ( )   No ( )
2. How many computers do you have in your institution for trainers to use in developing digital learning material?
3. How did you acquire them?
4. Is your institution connected to the internet?
5. What is the main use of the internet?
6. What is the estimate budget of ICT in your institution and how do you finance the budget?
7. How often do you offer in service training for your teaching staff?
   Monthly ( )   Termly ( )   Annually ( )
8. Do you believe that trainers are motivated adequately to use ICT in teaching and learning

9. Do you think trainer's work load has an influence in the use of technologies in teaching and learning? If yes, how

10. How many ICT technicians do you have in the department? Do you think they are adequate?

11. How many trainers have been allocated computers to develop digital learning material?

12. What has the government done through the state department of TVET done to support integration of ICT in teaching and learning process in your department?

Thank You

Appendix IX: Map of the Study Area
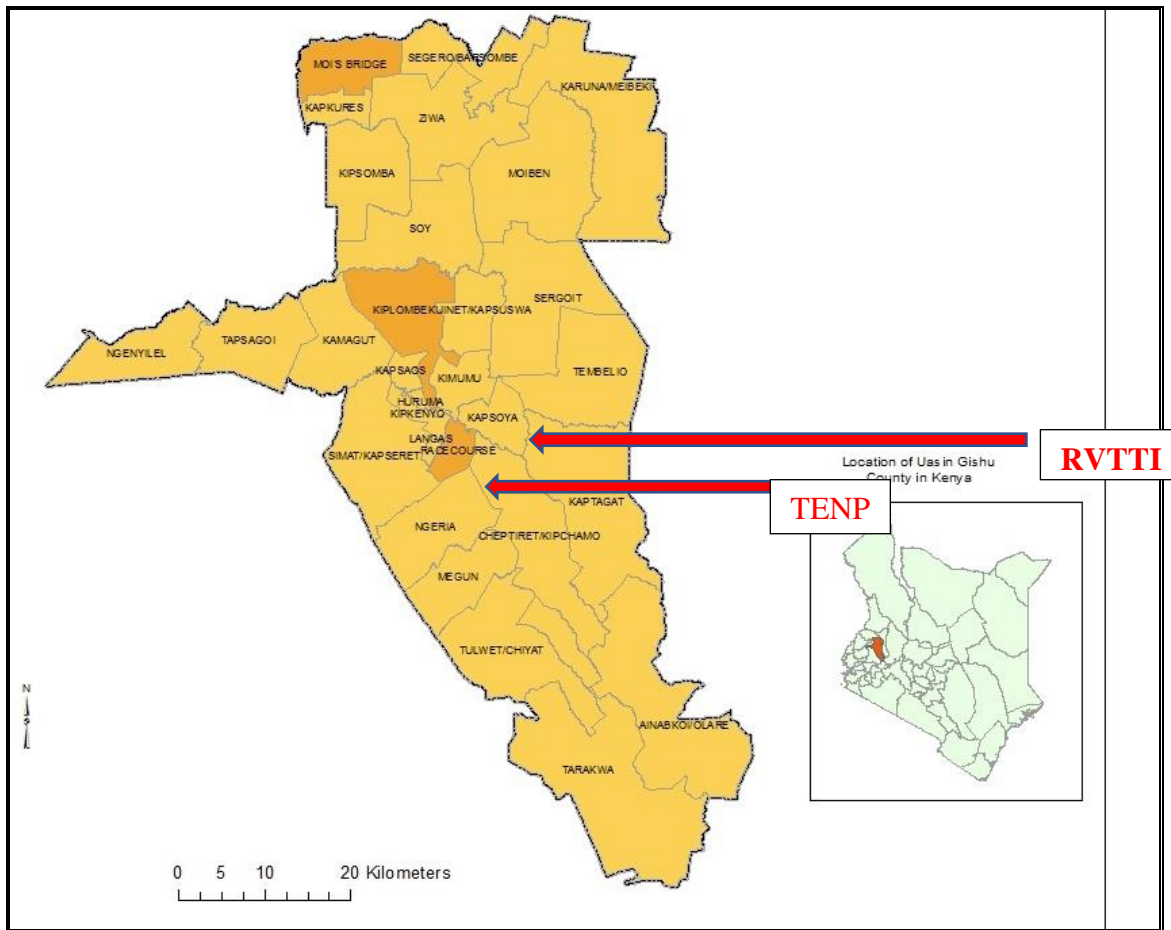
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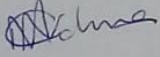Scan the QR Code using QR scanner application.
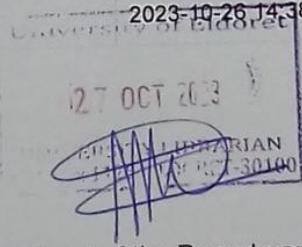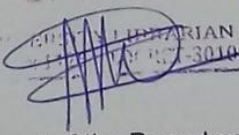
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