INTEGRATION OF INFORMATION COMMUNICATION TECHNOLOGY IN MANAGING TECHNICAL TRAINING INSTITUTIONS IN NAIROBI AND NYERI COUNTIES, KENYA

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DECLARATION

Declaration by Candidate

This thesis is my original work and has not been presented for a conferment of a degree in any other University or for any other award.

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Declaration by Supervisors

We confirm that the work reported in this thesis was carried out by the candidate under our supervision and has been submitted with our approval as University supervisors.

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DEDICATION

I dedicate this thesis to my beloved wife Susan Njeri and my children, Margret Wanjiku and Praise Gatembu. Also, to my father Simon Gatembu and my departed mother Margret Wanjiku.

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My deepest appreciation goes to God, whose grace, strength and guidance have been my constant companions. In moments of challenge, uncertainty and triumph, I am reminded of the blessings bestowed upon me, which have enabled me to persevere and achieve this milestone.

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ABSTRACT

Information and Communication Technology (ICT) is acknowledged as a key driver for the worldwide economy, particularly in the progressively digitized era of the 21st century. Educational institutions can no longer effectively prepare students to function competently in the global economy without properly integrating ICT into their curriculum. The purpose of this study was to assess the level of integration of ICT in Technical Training Institutions (TTIs) in Nairobi and Nyeri Counties in Kenya. The study was guided by the following objectives: to evaluate the level of integration of ICT in performing administrative functions in Technical Training Institutions in Nyeri and Nairobi Counties, to examine the level of integration of ICT in conducting financial management, to assess the level of integration of ICT in instructional processes and to examine the level of ICT integration in assessment practices in Technical Training Institutions in Nyeri and Nairobi Counties, Kenya. The study was guided by the Adaptive Structuration Theory and Technical Pedagogical Content Knowledge (TPACK) model. The research design utilized in this study was a mixed methods design. The target population consisted of 1026 respondents. The sample size was 310 respondents, who included; 290 lecturers, 10 bursars and 10 principals from the 10 TTIs in the counties of Nairobi and Nyeri. The lecturers were selected using stratified random sampling, whereas the bursars and principals were selected using purposive sampling. Questionnaires and interview schedules were used to collect data. Reliability was tested using Cronbach alpha coefficient. The questionnaire's reliability was calculated and yielded a Cronbach's alpha (α) of 0.903 in the measurement of ICT integration while validity was ascertained through factor analysis. Quantitative data was analyzed using both the descriptive and inferential statistics with the aid of the Statistical Package for Social Sciences (SPSS) version 24.1. The qualitative data was analyzed in terms of the themes expressed by the respondents. Results of the study revealed a statistically significant difference in the level of ICT integration in administrative functions ($t=0.077$, $p=0.000$), financial management ($t=0.072$, $p=0.000$), instructional processes ($t=0.0731$, $p=0.000$) and assessment practices ($t=0.0724$, $p=0.000$) in TTIs in Nyeri and Nairobi Counties. This highlights the varying levels of ICT integration in TTIs in Nyeri and Nairobi Counties. The null hypothesis was hence rejected. The study recommends the need for the government to strengthen its ICT policy to facilitate enhanced resource allocation by both the government and respective institutions, aiming to further deepen the integration of ICTs in TTIs in Kenya.

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ABBREVIATIONS AND ACRONYMS

AST:	Adaptive Structuration Theory
EFA:	Education For All
ERP:	Enterprise Resource Planning systems
FGN:	Federal Government of Nigeria
GES:	Ghana Education Service
ICT:	Information and Communication Technology
IICD:	International Institute for Communication and Development
ILO:	International Labour Organization
ISMS:	Information Security Management Systems
JICA:	Japan International Cooperation Agency
MDGs:	Millennium Development Goals
MOE:	Ministry of Education
NEPAD:	New Partnership for Africa Development
ODL:	Open and Distance Learning
PHEA:	Partnership for Higher Education in Africa
SADC:	Southern African Development Community
SDGs:	Sustainable Development Goals
SIDA:	Swedish International Development Agency
SPSS:	Statistical Package for Social Sciences
STI:	Science, Technology and Innovation
TPACK:	Technological Pedagogical Content Knowledge
TVET:	Technical Vocational Education and Training
TVETA:	Technical Vocational Education and Training Authority
TEVETs:	Technical Education and Vocational and Entrepreneurship Institutions
TVETs:	Technical Vocational Education and Training Institutions
UN:	United Nations
UNESCO:	United Nations Educational, Scientific and Cultural Organization
UIS:	UNESCO Institute for Statistics
UNICEF:	United Nations Children's Fund
USAID:	United States Aid

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter presents the subsections contained herein. These include the background of the study, the statement of the problem and the purpose of the study. The specific objectives, research hypotheses, significance of the study, theoretical framework, conceptual framework, assumptions of the study and operational definitions of terms are also presented in this section.

1.2 Background of the Study

Information and Communication Technology (ICT) serves as an instrumental enabler for processes and functions within organizations, particularly in educational institutions in the 21st century (Ahmad, Danjuma & Hamani, 2022; Ibrahim, 2010; Krishnaveni & Meenakumari, 2010; Sarkar, 2012).The modern world is characterized by continuous changes in politics, economics, technology and notably, in the realm of education. Recognizing the need for global economies to adjust to the swiftly evolving global landscape, ICT has gained recognition as a significant innovation with substantial potential for adaptation.

The significant expansion of ICT in conjunction with globalization has presented both significant challenges and opportunities in the education sector (Palvia et al., 2018). UNESCO (2015) emphasizes the importance of utilizing tools encompassing microelectronics and telecommunications for the automated processes of acquiring, analyzing, storing, retrieving, manipulating, managing, controlling, moving,

displaying, transmitting, receiving and exchanging both quantitative and qualitative data. This technology is essential for effective administration within educational institutions, serving as a pivotal and central component for advancing educational objectives to align with the requirements of the knowledge-based economy in the 21st century.

The modern society's educators are therefore emphasizing the impartation of 21st century skills to learners, which consist of flexibility in learning styles, competency, learner-centeredness and inclusion as they strive to achieve the realization of the Sustainable Development Goals (SDGs) (Sarkar, 2012). Contemporary pedagogy also seeks to impart technical skills and improve digital skills, which are highly demanded in the job market (Morze, Smyrnova-Trybulska & Boiko, 2019). The 21st century job market and industry require students graduating from higher learning institutions and technical training institutions to be versatile in knowledge transfer and flexible in acquiring skills (Van Doorn & Van Doorn, 2014).

Hence, there is a critical emphasis on one of the 21st century skills, which comprises learning to learn. The 21st century digital skills, which emphasize digital competence, digital literacy, e-skills, internet skills, have shifted from a technical orientation to a broader perspective that considers the acquisition of content-related or higher-order skills. This narrows down to soft skills such as communication, collaboration, creativity, critical thinking and problem-solving (Tang & Chaw, 2016).

Digital literacy refers to a broad range of knowledge, abilities, attitudes and exposures developed for understanding and applying digital devices and related technologies to

address social issues in politics, business, technology and education (Addah, 2012; Sharma et al., 2016; Sitienei, Korir, & Koske, 2023). Therefore, with the surge of Technical and Vocational Education and Training (TVET) institutions advancing in technological development, digital literacy will be paramount in ensuring digital transformation and digital usage among their trainers and students. For instance, new methods explored in effectively developing and delivering courses to students, such as open distance learning, will require digital devices. Hence, to ensure efficiency in the application and use of technology in the teaching and learning of both trainers and students, digital literacy will be essential to provide knowledge on the application of digital devices (Blevins, 2018).

The Qingdao Declaration on ICTs in education underscored the imperative of fully harnessing the potential of ICTs to meet educational objectives related to fairness, accessibility, quality and lifelong learning as outlined in the SDGs (UNESCO, 2015). This principle applies to TVET, which has evolved from merely providing semi-skilled operators to generating highly skilled professionals in virtually all technological domains (Tok & Sora, 2013). According to UNESCO (2016), it is now feasible to integrate ICTs into various aspects of TVET, including its administration and to promote information literacy. This transformation will bring about substantial changes in how we conceive, govern, finance and organize TVET institutions, ensuring that the sector can effectively address the economic, equity and sustainability challenges of the 21st century world.

Furthermore, the adoption of digitalization has been viewed as the key approach to directly fulfill the fourth SDG (Sparviero & Ragnedda, 2021). This goal seeks to

enhance the competencies of both young people and adults, particularly in technical and vocational skills, to promote employment, decent work and entrepreneurship by 2030, as outlined by the World Bank (2017). Consequently, governments worldwide that have committed to the United Nations' socio-economic agenda defined in the SDGs and the Education Framework for Action 2030 face the challenge of reconfiguring their educational institutions and existing teaching methods to align with the rapidly evolving demands of our technology-driven world.

This development has given rise to the formulation of digital strategies aimed at supporting education, as illustrated by Patra & Mete (2014). Moreover, it has led to a transformation in the utilization of computers and an increasing requirement for ICT skills in the contemporary workforce (Tomaro, 2018). Consequently, governments have been compelled to establish policies for educators to ensure that students are adequately prepared to meet the demands of the 21st Century.

These shifts, in conjunction with changes in how 21st Century learners communicate, have influenced the methods employed in instructional processes and the management of technical institutions (Lawrence & Tar, 2018). As a result, ICT has emerged as a crucial area in the field of education and socio-economic policies, bringing about substantial advancements in both physical and human resource development in both developed and developing nations (Tuwei & Ocholla, 2023).

1.2.1 Global Perspective of Integration of ICT in Management of TTIs

The integration of ICT has led to significant transformations in global social and economic progress (Peeraer & Van Petegem, 2011). These transformations transcend

the mere proliferation of ICT devices in workplaces, educational institutions and households, giving rise to more profound shifts in economic expansion and the development of human capital. These changes go beyond the mere increase in the number of ICT devices in workplaces, schools and homes, leading to more fundamental shifts in economic growth and human capital development.

Such economic and social changes have given rise to the growth of knowledge economies and learning societies, making knowledge and learning the core of economic productivity and social advancement (Kozma & Vota, 2014). To illustrate, Asian nations like South Korea, Singapore and Malaysia, which have embraced ICT in Technical and Vocational Education and Training (TVET), have witnessed significant socio-economic advancements (Cheng, 2017). The incorporation of ICT into TVET is regarded as a strategic move for economic development, particularly in developing countries.

The European Union has recognized ICT as the instrument to revitalize and position TVETs as essential tools in its efforts to prepare young people for work in the modern economy (Pradhan et al., 2020). This aims to ensure Europe's competitiveness and innovation in the face of increasing global competition and shifting world demographics (Picatoste et al., 2018). However, not all European countries have smoothly adopted this approach. Research conducted by Papadakis (2016) revealed that although Europehad some of the world's best educational facilities, it lagged behind in integrating ICT in TVET compared to countries like China, Taiwan and India. Nonetheless, some countries like Germany have made significant strides in establishing TVET ICTinfrastructure.

In Germany, the digitalization of TVET processes has significantly contributed to people's confidence in a wide range of professions, believed to be responsive to changing labour market needs. This progress has been supported by substantial ICT infrastructure and human resource development (OECD, 2014). In response to the increasing computerization of skilled labour and the potential for ICTs to transform TVET, the Federal Institute for Vocational Education and Training regularly announces targeted competitive funding measures for applying "digital media" in vocational education and training.

Australia considers the adoption of new technologies within TVET as essential for expediting progress in the modern economy (Kanwar et al., 2019). In accordance with this perspective, the introduction of flexible learning was perceived as a transformative initiative, leading to the implementation of a national development program spanning five years, known as the Australian Flexible Learning Framework (Khan et al., 2016). Notably, the introduction of e-learning in TVET has resulted in a significant increase in enrollments in vocational programs, affording learners the opportunity to acquire skills and transfer their credits to universities. Furthermore, shared web platforms have been established to disseminate knowledge regarding skills and technical innovations (Robyn, 2017). Australia serves as an exemplary case study for the successful integration of ICT into TVET education.

In Malaysia, ICT has been widely accepted and used as an education management tool. However, TVETs have yet to match the general education system in terms of ICT usage (Latchem, 2017). In Britain, the integration of ICT in the management of TVETs has

been reported to be slower compared to the mainstream education system, which is often perceived as inferior (Singh & Chan, 2014). This slower integration is said to result from inadequate policy attention and practice.

A study by UNESCO (2017) analyzes the status of ICT facilitation and integration across a range of countries in the Asia Pacific region. Despite adequate ICT facilitation, countries like Singapore, South Korea and Japan have reported a slow adaptation by teachers from traditional face-to-face pedagogical approaches to digital methods. In New Zealand, the formulation of ICT policies specifically for TVETs has been reported to lack an effective action plan for all facets of ICT integration (Granshaw, 2016). Furthermore, according to Dixon and Hutton (2016), despite policy commitments to ICT, the integration of ICT in TVETs in countries like Bangladesh, Nepal and Mongolia has hardly taken off, largely due to poor ICT infrastructure and inadequate teacher training.

1.2.2 Regional Perspective of Integration of ICT in Management of TTIs

In Africa, it is evident from research that the adoption of ICT in the field of education is currently in a dynamic phase, characterized by daily advancements and changes (Naidoo & Dawuwa, 2019). The integration of ICT into educational and training practices is in the midst of a significant transformation, as highlighted by Taylor and van der Bijl (2018). There seems to be a noticeable shift from a decade of experimentation involving donor-supported, NGO-led, small-scale pilot projects for ICT use in education, towards a new phase of systematic integration guided by national government policies and multi-stakeholder- driven implementation processes.

Initially, the focus of ICT in education was on general education, but now the attention has turned towards TVETs. This shift in focus is believed to align not only with the time-bound commitments of SDGs but also due to its potential to bridge the knowledge gap and techno-economic disparities between regions and to enhance economic activity (Naiker & Makgato, 2018). Consequently, multi-partnerships involving public and private entities and civil society have been established to advance ICT goals.

The African Development Bank (2012) also points out that ICT is increasingly playing acentral role in enhancing productivity and efficiency in service provision across both private and public enterprises. Additionally, ICT is recognized as a driver of the new economy and ICT literacy is projected to become a fundamental skill for survival in our increasingly digital world (Fraillon et al., 2020). ICT provides individuals from diverse backgrounds with the means to efficiently access, assess, utilize and generate information to achieve their personal, social, vocational and educational goals (UNESCO, 2014; Kosgei, Kipkoech & Limo, 2023). Consequently, there is an increasing demand for the incorporation of ICT into a broad spectrum of functions within institutions globally.

Educational establishments have been continuously adopting ICT to stay competitive in the ever-changing educational landscape influenced by swift digital advancements (Richardson, 2011). In today's context, educational institutions can no longer adequately equip students for success in the global economy without the thorough integration of ICT within the curriculum (Hutchison & Reinking, 2011). Information and Communication Technology (ICT) provides robust platforms that transform traditional teacher-centered classroom instruction into technology-enhanced teaching.

This approach not only focuses on students but also creates opportunities for interactive learning environments (Anita & Simiriti, 2011). Kozma (2011) contends that ICT has facilitated the restructuring of instructional methods, making education accessible to a wider population.

A survey conducted by UNESCO (2017) assessed the extent of ICT support and integration in various countries within the Asia Pacific region. While these countries, such as Singapore, South Korea and Japan, possess sufficient ICT resources, they have reported a slow adoption of digital teaching methods by educators. In New Zealand, there is a notable absence of effective strategies for the integration of ICT in Technical and Vocational Education Training (TVET) programs, despite recognizing its significance (Granshaw, 2016). Additionally, despite their commitment to ICT integration in education, nations like Bangladesh, Nepal and Mongolia have encountered challenges due to inadequate ICT infrastructure and insufficient teacher training (Dixon & Hutton, 2016).

In Africa context, studies indicate that nations like Egypt, Mauritania, Morocco and Sudan have outlined digitalization strategies for TVET programs as part of their ICT policies (Lolwana, 2017). In Nigeria, the national ICT program's master plan envisions the incorporation of ICT across all levels of education, including TVET (Garba, 2014). More specifically, ICT is seen as vital for the virtual transmission of knowledge from TVET institutions so as to overcome geographical and financial barriers, hence enabling practical skills acquisition (Abubakar, 2016). This entails the provision of both physical and human resources for the implementation of ICT.

In Zambia, the Technical Education and Vocational and Entrepreneurship Training Institutions (TEVETs) policy aims to provide training accessible to all citizens (Konayyuma, 2019). However, TEVETs have faced challenges with low enrollments due to limited access, lack of funding, geographical distance, shortage of qualified staff and inflexible training pathways (Mallionson, 2019). To address these issues, the integration of ICT in learning programme's is a key policy approach. E-Learning, open and distance learning (ODL) are growing in TEVET with the goal of providing accessible quality learning for the majority of Zambians (Hoosen & Butcher, 2017). This aligns with Zambia's strategic plan of implementing the Competency-Based Curriculum Training in TEVETs.

Similarly, in Rwanda, the integration of ICT into TVET is acknowledged as a viable strategy to revitalize these institutions, attract contemporary learners and impart competitive skills relevant to the job market (Mugiraneza, 2021). Furthermore, in the African context, there is a reported disparity between the utilization of ICT for institutional management and pedagogical purposes. A UNESCO study conducted in collaboration with various African nations in 2015 revealed that even though national or institutional ICT frameworks are in place, they do not necessarily create a conducive environment for the growth of educational technology. This challenge is also observable in countries like Namibia and Zambia.

1.2.3 Local Perspective of Integration of ICT in Management of TTIs

Since the inception of the new millennium and the adoption of the Millennium Development Goals (MDGs) and Education for All (EFA) initiatives, ICT has evolved into a prominent element in both education and other socio-economic policies in Kenya.

Moreover, ICT has been deemed crucial for achieving both Kenya Vision 2030 and the Sustainable Development Goals set for 2030 (UN, 2015). The government recognizes that a workforce literate in ICT forms the foundation upon which Kenya can transition into a knowledge economy (Saina et al., 2018). The National ICT Policy, Sessional Paper No. 1 of 2005, Sessional Paper No. 14 of 2012 (Ministry of Education, 2012) and Vision 2030 direct significant attention towards schools as pivotal agents in addressing digital divide challenges and expanding ICT learning opportunities. This approach enhances the greater integration of ICTs in TVETs, for which the Ministry ofEducation Science and Technology has devised an ICT integration strategy (Muyaka &Kitainge, 2021). The strategy aims to empower a substantial number of unemployed youths who are excluded from the formal skills training system.

Moreover, the ICT policy places significant emphasis on equipping 43 Technical Training Institutes (TTIs) with digital equipment. By the year 2020, more than 3,872 Master teacher trainers had received training in ICT and over 30,653 teachers had completed ICT integration training (TVET Authority Kenya Report, 2020). Additionally, there are proposals for a draft ICT lecturers' competency framework and the establishment of an e-resource Center (Agufana et al., 2018). Furthermore, workshops and training sessions for teachers on the use of ICT for teaching, learning and administration have been organized (MOE, 2019). The Ministry of Education (MOE) had set a mandate for all teachers to achieve ICT literacy by 2015. With this level of support, combined with technical assistance, the maintenance of ICT facilities and the promotion of ICT leadership, the integration of ICT is expected to progress effectively.

However, in Kenya, there has been negative profiling of TVET, leading the youth to question its quality and perceive it as an educational path for those with lower academic achievements (Obwoge & Kibor, 2016). Consequently, the Kenyan government restructured the education sector through the enactment of the TVET Act of 2013 and the rebranding of TVET (Wilberforce, 2017). This effort has significantly changed TVET enrollment, doubling from 267000(two hundred and sixty-seven thousand) students in the year 2017 to 451000 (four hundred and fifty-one thousand) students in the year 2020 as depicted in Figure 1.1 below.

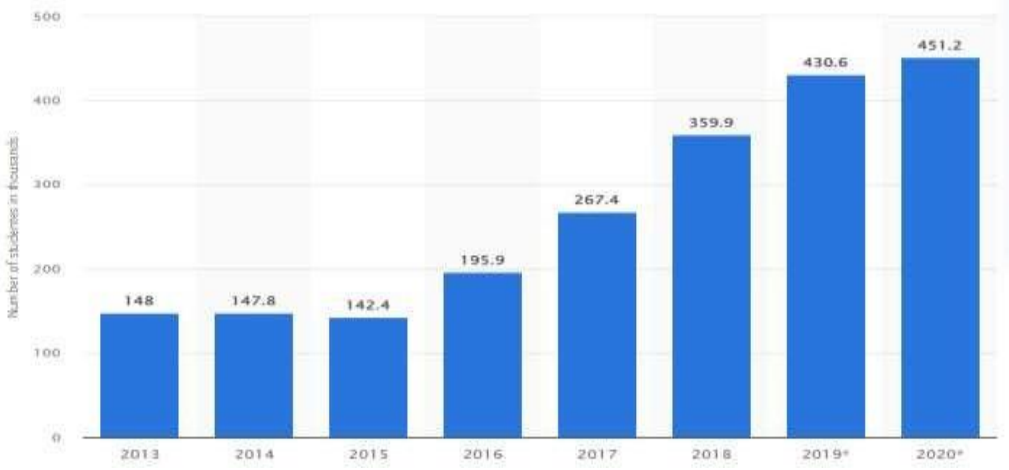

Figure 1.1: TVET enrolment trend in Kenya

Source: Economic Survey, 2021

As shown in Figure 1.2 below, the Kenyan government's expenditures on TVET have increased to an average of 4.7% of the total budget allocated to the Ministry of Education.

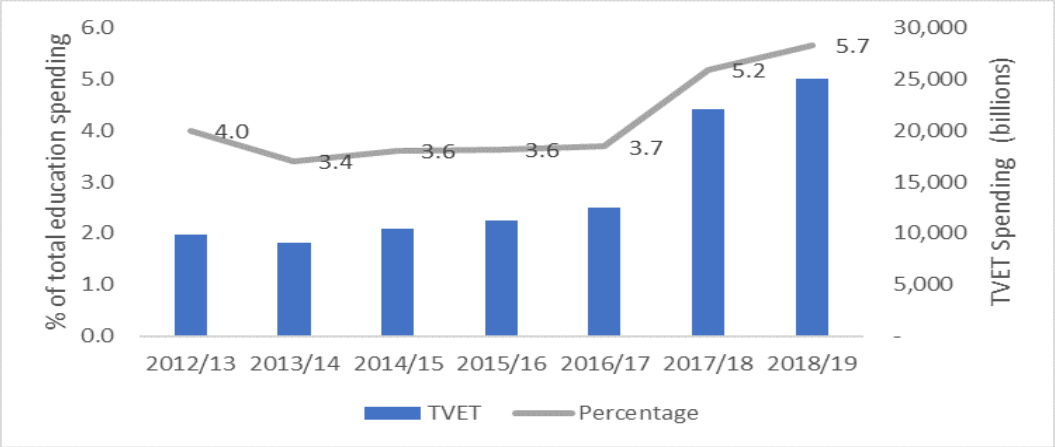

Figure 1.2: TVET Financing Trend in Kenya from year 2012 to 2019

Source: KIPPRA (2019), Revitalizing Technical vocational Education &Training

Moreover, students joining TVETs in Kenya through the Kenya Universities and Colleges Central Placement Service are eligible for a Ksh 30,000 government bursary and a Ksh 40,000 loan from the Higher Education Loans Board. This incentive is attracting prospective students to enroll in TVETs. Mwangi (2016) reported that a combination of factors, including environmental, teacher and institutional factors, determine the extent of ICT integration.

These factors must be coordinated to achieve TVET goals. As a management tool, ICT can be integrated into various facets of education management, including financial and instructional management (Deya, 2016). ICT integration in administrative management involves using technology to enhance planning, setting standards, implementing change and monitoring the results of core functions within a learning institution. According to Mtebe (2015), ICT has transformed school administration by facilitating the transfer, storage, retrieval and processing of information by individuals working, studying, or interacting within and outside institutions.

Furthermore, Mtebe (2015) points out that ICT is employed in record maintenance, communication and document management. This has enhanced efficiency in daily institutional operations, particularly in managing information related to students, staff and resources (Ohliati & Abbas, 2019). ICT has been instrumental in automating procedures for admissions and in overseeing the records of staff and students. The incorporation of ICT is increasingly becoming an integral aspect of life in TVET and is becoming essential in the domain of financial management (Jared et al., 2017). In agreement with this perspective, Ngugi (2012) noted that ICTs have demonstrated their worth in the storage and analysis of data for school financial management. This includes functions such as managing budget allocations, expenses, student fee payments and overall accounting.

Amukhuma (2018) argues that financial planning and control, as well as the budgeting process in schools, require access to multiple sources of information, which can be best facilitated through the incorporation of ICT into institutional management systems. Budget allocation, as an aspect of the budgeting process in a learning institution, necessitates reliable, timely, user-friendly information to support management decisions. Mwangi (2016) also suggested that technology use in financial management enhances resource control.

Instructional management aims to improve teaching and learning processes by emphasizing ways to instill excellence in instructional quality (Maina et al., 2016). It involves guiding and influencing teachers and students to strive for effective teaching and learning behaviors to achieve educational goals and objectives and ICT aptly fills this role. Meryo and Boit (2012) also affirmed that learning institutions are designed to

educate students, provide vocational training and foster creativity, all of which are greatly enhanced through the incorporation of ICT management systems.

ICT has the potential to enable TVETs to achieve their goals. Abdelmoiz et al. (2018) assert that ICT can be used to transfer skills to students regardless of limitations of time and space through open and distance learning. This implies that ICT can effectively be utilized in classrooms to significantly assist teachers in facilitating the teaching of complex skills. Nevertheless, the challenge lies in balancing investments in ICT and educational outcomes (Abuya, 2014). Contextual interpretations of implementers may differ from the actual experiences of users, limiting the realization of digitalization benefits (Sainaet al., 2018). Furthermore, the benefits of ICT integration will vary depending on the level of integration, which can differ from one institution or country to another.

It is widely agreed that the incorporation of ICT into educational and training institutions advances through distinct stages that can be perceived as a continuous sequence or a series of steps (Mbodila et al., 2013). These stages are commonly referred to as Emerging, Applying, Infusing and Transforming (UNESCO, 2017). Vorster and Goosen (2017) propose that the integration of technology can involve five stages: entry, adoption, adaptation, appropriation and invention. Nevertheless, achieving satisfactory progress in the integration of ICT remains a significant concern. The challenges associated with ICT integration continue to be pertinent, particularly in developing nations.

Technical Training Institutions (TTIs) in rural areas of Kenya have grappled with significant challenges in integrating ICT into their educational systems. These challenges have been exacerbated by the historical disadvantages faced by rural regions, such as limited access to modern technology, reliable internet connectivity and computer resources (Sifuna, 2020). The absence of robust ICT infrastructure has, in turn, hindered TTIs' ability to provide contemporary and digitally enriched curricula, leaving their students at a considerable disadvantage compared to their urban counterparts. This digital divide is further compounded by disparities in funding and government support, which have predominantly favored urban educational institutions (Wasike, Ingendi & Maiyo, 2020).

Nevertheless, there have been recent initiatives aimed at improving ICT integration in rural TTIs, reflecting efforts to embrace ICT for instructional purposes. These initiatives are critical in ensuring that students in these institutions do not miss out on the opportunities and skills that digital technologies can provide, as highlighted by the study conducted by Ngeera, Nyangweso and Thuba (2022).

In contrast, urban regions in Kenya have generally enjoyed more advanced infrastructure, including widespread high-speed internet connectivity and well-equipped computer facilities. Consequently, TTIs in urban areas are better equipped to offer curricula that are enriched with digital tools, giving their students a significant advantage in terms of technology-related skills (Ngware et al., 2022). Moreover, the availability of funding and government support has enabled most urban TTIs to stay aligned with evolving technological trends and pedagogical methods. This, in turn,

equips their students to be more competitive in the job market and better prepared for the digital demands of the modern workforce (Nyangweso, 2022).

However, previous research in Kenya has revealed a misalignment between ICT policies, the provision of digital resources and the implementation of technology for the administration of educational institutions. Notably, there has been a noticeable delay in the adoption of technology for the management of secondary schools and teacher training colleges (Kimosop & Mulwa, 2016). In the case of Technical and Vocational Education and Training (TVET) institutions, ICT policy and infrastructural support initially faced delays, but with the enactment of the TVET Act of 2013, support has become more significant (Amukhuma, 2018).

The Kenyan government, often in partnership with donors and bilateral organizations like USAID, has supplied digital materials to TVETs, with TVETs in Nyeri and Nairobi Counties being among the primary beneficiaries (MOE, 2014). Nevertheless, the extent to which technology has been integrated into TVET management systems has not received sufficient scholarly attention. Furthermore, only a few studies on ICT integration have conducted comparative analyses to evaluate the extent of ICT integration among TVETs in different counties of Kenya. For instance, Maina et al. (2016) conducted research on instructors' pedagogical readiness for ICT integration in TVET institutions in Kenya, involving a comparative analysis of TVET institutions in Murang'a and Kiambu counties, focusing on the effects of pedagogical readiness on effective ICT integration in these two counties.

1.3 Statement of the Problem

Information and Communication Technology (ICT) is widely acknowledged as a crucial tool for strengthening education systems and enhancing the quality of learning (Ahmadi et al., 2011; Das, 2019; Talebian et al., 2014). However, the extent to which ICT is integrated into the management of Technical and Vocational Education and Training (TVET) institutions in Kenya remains inadequately documented and understood.

Despite the recognized instrumental role of ICT in institutional management (Karanja et al., 2018; Kidombo et al., 2012; Yunis et al., 2018; Wims & Lawler, 2007), there is a need to comprehensively document and demonstrate its integration in various functions, including financial, pedagogical, assessment and administrative aspects, within technical institutions. This necessity is particularlyemphasized in the context of the rapidly evolving contemporary society, where institutions must operate efficiently and effectively to produce graduates who are technologically proficient and equipped to excel in the competitive 21st-century world.

In Kenya, efforts to assess ICT usage have primarily centered on secondary education (Chege, 2014; Musyoki, 2016; Tanui, 2015), potentially due to historical biases in ICT facilitation. However, the significant emphasis on ICT within Technical and Vocational Education and Training (TVET) institutions in recent years has not received equivalent attention in research. Abuya (2014) conducted a study that examined the effects of integrating ICT in Technical Training Institutions (TTIs) in Kenya. The research highlighted the challenges faced by TTIs in incorporating ICT and discussed the overall influence of ICT integration across all TTIs in the country. Likewise, a study conducted

by Agufana et al. (2018) investigated the relationship between trainers' perception of ICT ease of use and its application in instructional contexts within TTIs in Kenya. However, this study did not delve into the specific levels of ICT integration in instructional processes.

Consequently, this present study aims to address the identified research gaps by assessing the integration of ICTs in TTIs, particularly in the management domain, within the context of digitalization and expansion in Nyeri and Nairobi counties in Kenya.

1.4 Purpose of the Study

The purpose of the study was to assess the level of integration of ICT between TTIs in Nairobi and Nyeri Counties in Kenya.

1.5 Specific Objectives

The study was guided by the following specific objectives, which were to;

1. Evaluate the level of integration of ICT in performing administrative functions in Technical Training Institutions in Nyeri and Nairobi Counties in Kenya.
2. Examine the level of integration of ICT in conducting financial management inTechnical Training Institutions in Nyeri and Nairobi Counties in Kenya.
3. Assess the level of integration of ICT in instructional processes in Technical Training Institutions in Nyeri and Nairobi Counties in Kenya.
4. Examine the level of ICT integration in assessment practices in Technical Training Institutions in Nyeri and Nairobi Counties in Kenya.

1.6 Hypothesis of the study

1. There is no statistically significant difference in the level of integration of ICT in administrative functions between Technical Training Institutions in Nyeri and Nairobi Counties in Kenya
2. There is no statistically significant difference in the level of integration of ICT in financial management between Technical Training Institutions in Nyeri and Nairobi Counties in Kenya
3. There is no statistically significant difference in the level of integration of ICT in instructional processes between Technical Training Institutions in Nyeri and Nairobi Counties in Kenya
4. There is no statistically significant difference in the level of integration of ICT in assessment practices between Technical Training Institutions in Nyeri and Nairobi Counties in Kenya.

1.7 Significance of the Study

Research on the integration of ICT in TVETs may inform policy makers as they formulate strategies to enhance ICT integration for 21st-century skills. It is hoped that the findings of this study may benefit TVET educational policy makers. The management team and BOMs of various TVET institutions may also use the findings of this research to inform college-level policies on the usage of ICT in instruction, management and assessment. The management may provide impetus for in-service sensitization of all staff in the institutions regarding the suitable integration of ICT in their operations. This study may have the potential to make a valuable contribution to TVET managers as it may provide information and rate the level of ICT integration for the purpose of improvement.

The findings of the study may also provide a rationale to the MOE, donors, parents as well as institutional administrators for heavy investment and spending in ICT infrastructure in TVETs. The government may also benefit, as the findings may help track the progress of ICT integration in line with time-bound international and local commitments. Finally, the study may also contribute to the seldom-existing research and scholarly efforts on the integration of ICT in TVETs.

The Board of Management in various TVET institutions may utilize the findings as a basis of financing ICT mediated teaching and learning in their institutions of mandate. This may help the BOM harness the advantages of ICT integration in managing TVETs The findings may entice trainers to enhance delivery of ICT mediated classes that cater for individual learning styles and abilities. This in turn can improve TVET student's motivation, participation and academic achievement.

The Ministry of Education in Kenya may apply this finding in transforming the way it communicates with TVETs to enhance the ease of supervisory role it plays. The MoE can achieve significant strides towards mainstreaming ICT in performance contracting and addressing shortage of qualified trainers. The principals of TVETs can utilize the findings as a basis for encouraging their deputies and heads of sections to integrate ICT in their administrative functions effectively making administration of the TVET institution.

Strengthening managerial capacity of various cadres of educational personnel is a major function of KEMI. This finding may be utilized by KEMI as an indicator of the existing gaps that TVET Principals, Bursars and trainers may be having and need to be

addressed. Researchers in the field of TVET, ICT and education management may utilize this study in various ways. They can use the results to validate and support findings from their own studies. They may also base their work on the conceptual framework provided. In addition, they may apply the theoretical approaches outlined in this study to their studies.

1.8 Theoretical Framework

The study was guided by Adaptive Structuration Theory, advanced by DeSanctis and Poole (1994) and the Technical Pedagogical Content Knowledge (TPACK) model, advanced by Koehler and Mishra (2005). The two theoretical underpinnings helped to offer the lenses through which we look at complicated processes and help move the focus from particular to general (Reeves et al., 2008). In essence, the Adaptive Structuration Theory, advanced by DeSanctis and Poole (1994), was found important while looking at the administrative and finance management functions in TTIs. The instruments section on Integration of ICT in Administrative Functions and Integration of ICT in financial management were based on this theory. The TPACK model, developed by Koehler and Mishra in 2005, holds significance in analyzing the methods of teaching and evaluation within Technical Training Institutions (TTIs). Furthermore, the sections concerning the Integration of Information and Communication Technology (ICT) in both teaching processes and assessment practices are built upon these concepts. The rationale behind each theory's adoption and their respective merits are discussed.

1.8.1 Adaptive Structuration Theory

The study is based on Anthony Giddens' (1984) structuration theory. The theory is formulated as "the production and reproduction of social systems through members' use

of rules and resources in interaction." DeSanctis and Poole adapted Giddens' theory to study the interaction of groups and organizations with information technology, naming it Adaptive Structuration Theory (Barrett, 2018). The theory criticizes the technocentric view of technology use and emphasizes the social aspects. Groups and organizations using ICT for their work dynamically create perceptions about the role and utility of the technology and how it can be applied to their activities (Aktaruzzaman & Plunkett, 2016). These perceptions can vary widely across groups and may influence the way technology is used, thus mediating its impact on group outcomes.

Adaptive Structuration Theory (AST) has been used for several years in the information systems discipline to study the use of new technologies in organizations (Elbasha & Wright, 2017). Organizations have adopted advanced ICT technologies aimed at revolutionizing management activities through sophisticated technologies. Proponents of AST contend that developers and users of these systems (ICT) hold high hopes for their potential to change organizations for the better, but actual changes often do not occur consistently, or they occur inconsistently (Barrett, 2018). Adaptive Structuration Theory (AST) examines the change process from two vantage points: firstly, the types of structures provided by advanced technologies and secondly, the structures that actually emerge in human action as people interact with these technologies.

The theory was relevant to this study because ICT investments in TVETs have been made with the aim of bringing about change and efficiency to meet the labour requirements of the 21st century (Deya, 2016). Indeed, the Kenyan Government, in collaboration with donors, began by providing digital equipment to 43 institutions. Moreover, efforts have been made to improve the ICT competencies of teachers and

principals (MOE, 2014). However, doubts have arisen over the achievement of the intended goals. According to Aktaruzzaman and Plunkett (2016), the impact of technology on management can only be realized through effective implementation.

In this regard, the theory was useful in examining the status of ICT support, both physical and human, as well as scaling expected outcomes in relation to the incorporation of ICTin the management of the institution. There is an anxiety about Giddens claim that structures have no existence independent of the knowledge that human subjects have about what they do in their daily lives. In this respect, the theory fails to accord sufficient ontological status to the pre-existence of social forms, specifically the impact of social distributions of populations upon human action as posited by Margret (1982). This is despite the notion of structuration being appropriate to routine social practices. John B. Thompson (1989) further questions the analytical value of the notion of rules and resources for grasping social structure.

1.8.2 Technical Pedagogical Content Knowledge (TPACK) model

Technical Pedagogical Content Knowledge (TPACK) was introduced by Mishra and Koehler (2006). Technical Pedagogical Content Knowledge (TPACK) was formulated as a conceptual model aimed at enhancing teachers' knowledge, specifically in terms of incorporating technology (Akyuz, 2018).Technical Pedagogical Content Knowledge (TPACK) is rooted in Shulman (1986) exploration of Pedagogy, Content and Knowledge. The incorporation of technological expertise by Koehler and Mishra (2006) was meant to elucidate the effectiveness of teaching through technology use.

Despite being initially mentioned by Mishra and Koehler (2006), this concept is not

novel, as numerous scholars have explored a comparable idea while delineating the connections between technology, content and pedagogy (Herring et al., 2016). The TPACK framework has evolved into a benchmark for various research endeavors that focus on the integration of technology in teacher education. It has become a clear and valuable framework for researchers seeking to understand how technology is incorporated into teaching and learning methods (Baran et al., 2011). Therefore, it was highly relevant to this study. However, Yani et al. (2019) criticized TPACK by observing the limitations of media and teaching tools in learning institutions. TPACK does not provide how trainers can advance their strengths in each component.

1.9 Conceptual Framework

A conceptual framework was constructed to illustrate the anticipated connection between the variables that stand independently and the variable that depends on them. The independent variables encompassed the degree of ICT integration in administrative functions, financial management, instructional processes and assessment practices. Simultaneously, the dependent variable was the management of TVET institutions in Nyeri and Nairobi counties, Kenya.

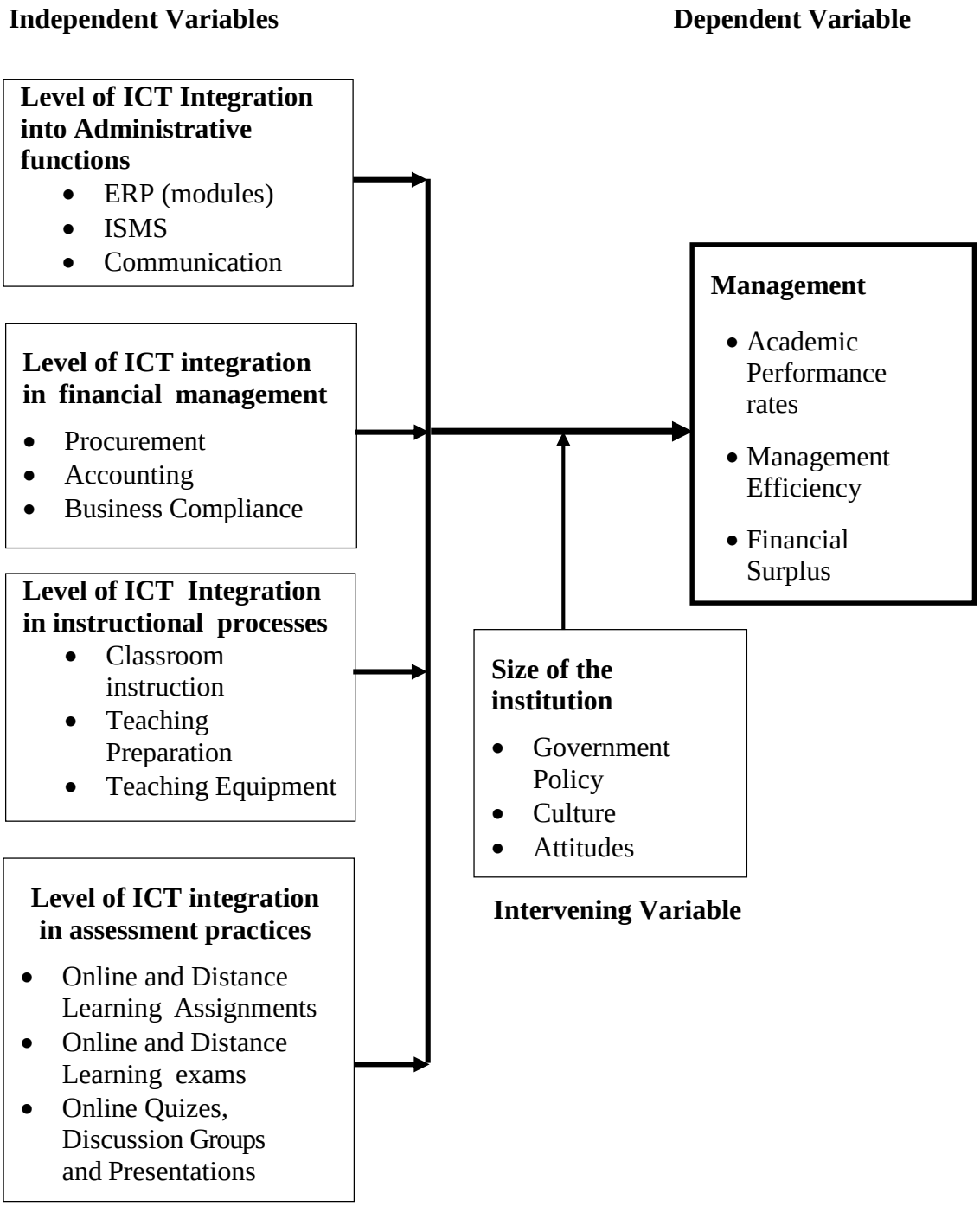

Figure 1.3: Conceptual Framework

1.9.1 Administrative Functions

The majority of functions and responsibilities related to administration revolve around ensuring the smooth functioning of an office. The nature of these functions can vary based on the specific sector and the size of each organization. These responsibilities primarily involve the maintenance of office operations, encompassing the management of phonecalls, emails, calendars, internal communications, report writing, procurement of office supplies, equipment and certain human resource duties (Almajalid, 2017).

Administrative assistants, secretaries, or office assistants are primarily accountable for these administrative functions. They perform supportive roles within the offices of senior executives, including CEOs, directors and senior managers. For instance, they arrange appointments, organize company meetings, reserve suitable conference and meeting rooms. Also they coordinate events involving senior executives and managers (Salama et al., 2018).

Additionally, they engage in activities such as document filing and database management. They design file systems, update spreadsheets, perform various data entry functions and ensure the proper preservation of confidential data. In certain cases, administrative assistants, particularly in small firms, might also handle some accounting practices, including preparing invoices, sending them to customers, recording and reconciling office expenses and compiling financial reports (Mykhailyshyn et al., 2018).

To efficiently carry out their functions, the majority of administrative professionals extensively rely on computers, various hardware and software tools. For instance, they

utilize Microsoft Office Suite and printers when creating and printing documents, employ WordPress for updating company websites and blogs and use software like QuickBooks, Sage and Enterprise Resource Planning (ERP) modules for accounting functions. Furthermore, ICT has significantly facilitated communication within organizations and with customers. Telephone systems, instant messaging, live chats, video conferencing, Information Security Management Systems (ISMS) and other customer relationship management systems have made communication more streamlined and effective (Benavides et al., 2020).

1.9.2 Financial Management

Financial management involves overseeing a business's financial matters to ensure its success and compliance with legal obligations. This encompasses four key elements: planning, budgeting, monitoring, assessing risks and devising financial procedures(Barr & McClellan, 2018). Financial managers gauge the amount of cash required for maintaining a positive cash flow, allocate funds for expansions or acquisitions and address unforeseen situations. They then convey this information to other business partners. Subsequently, they allocate available funds to cover expenses like rent, employee salaries, supplies and other liabilities. Ideally, they also reserve funds for unexpected costs and new business ventures (Brigham & Houston, 2021).

Additionally, they are tasked with establishing guidelines for how the finance team should accurately, securely, handle and convey financial information .This includes invoices, payments and reports. These written guidelines also delineate the individuals within the organization responsible for financial decision-making and approval (Connolly et al., 2019). The advancement of financial services in contemporary

businesses, particularly in terms of speed, efficiency and customer experience, is often attributed to the adoption of financial software solutions (Zietlow et al., 2018). Some of these software solutions encompass digital banking and payment technologies like credit cards, ETRs and mobile banking, along with Business Process Automation (BPA) software that streamlines supplier management and enables swift responses to market demands.

1.9.3 Instructional Processes

Instructional processes encompass the pedagogical approaches and teaching practices employed by teachers when interacting with their students, aiming to achieve learning objectives (Castro & Tumibay, 2021). These methods establish a conducive learning environment and are aligned with curricula, informed by assessment data, student needs and teacher preparation programs. They also involve integrating effective structures into lesson planning, aiding teachers in maintaining a consistent routine (Ifenthaler, 2017).

This structure allows students to focus on absorbing new content and activities instead of anticipating future steps or actions. Furthermore, to enhance students' comprehension and retention of new material, it's crucial for instructors to connect new information with existing knowledge (Kristanto & Mariono, 2017). Instructors should provide ample opportunities for students to practice both collaboratively with other students and under their guidance. This can be achieved through open-ended questioning, group discussions, seminars, symposiums, workshops and practical presentations (Seechaliao, 2017).

The incorporation of technology is also of importance in these activities, as it promotes greater interaction and involvement among teachers and students, as well as among the students themselves. As noted by Ifenthaler (2017), tools like computers, tablets and interactive whiteboards enhance the engagement in lessons and assignments. Classroom technology can also assist in breaking down functions into more manageable components, reducing the necessity for multitasking. For instance, it enables the separation of discussions from writing functions, simplifying the process by allowing students to take notes before typing or composing an essay.

1.9.4 Assessment Practices

Assessment practices refer to the deliberate and systematic process of collecting information on student learning and related aspects, while considering the teaching tools, skills and time available to enhance learning outcomes (Dorimé-Williams, 2018). Conventional assessment techniques, such as multiple-choice tests, true/false tests, short answers and essays, have been commonly employed. However, as education stakeholders have progressively improved curricula to enhance effectiveness, some contemporary alternative assessment methods have been adopted. These include portfolios, computer simulations, online learning modules, exhibitions and demonstrations (Wrigley & Straker, 2017).

Conventional assessments involve one-time testing, evaluating a learner's performance at a specific moment. Nevertheless, these test results don't indicate a student's progression and fail to pinpoint specific challenges they may have faced during the test. This assessment type also lacks feedback for learners. It often prioritizes lower-level cognitive skills like memorization and recall and requires students to demonstrate

knowledge in a particular manner (Martin et al., 2019).

In contrast, modern assessments focus on higher order cognitive abilities. They provide students the opportunity to showcase their learned knowledge, emphasizing development and performance. Even if a student can't complete a task at a given moment, they can later demonstrate their skills in a different context. This approach allows instructors to evaluate strengths and weaknesses within a contextual framework over time. Trainers who integrate digital technologies can enhance interactions with students, monitor their progress and track academic engagement more effectively (McCowan, 2018).

1.10 Assumptions of the Study

The study was based on the following assumptions;

i. Trainers in TTIs use ICT in their pedagogical processes.
ii. That TTIs are anchored on ICT as an important enabler of processes.
iii. That ICT has unexploited potential in transforming pedagogy and effective management of TTIs in Kenya.
iv. That respondents gave honest and reliable information regarding ICT integration in management of TTIs in Kenya.

1.11 Scope of the Study

The contextual scope of this study was on assessing the level of integration of ICT in managing administrative functions, instructional processes, assessment practices and in financial management among TTIs in Nairobi and Nyeri Counties in Kenya. Theoretically, the study was grounded on adaptive structuration theory and technical

pedagogical content knowledge (TPACK) model. The research methodology consists of a descriptive research design and utilizing quantitative research approaches. These approaches included questionnaires and interviews. The geographical focus of the research was on TTIs located in Nairobi and Nyeri Counties, where the unit of analysis was the TTIs in Nairobi and Nyeri counties, while the unit of observation comprised of the trainers, principals and bursars in the selected TTIs. The study was undertaken in the period between October 2022 June 2023.

1.12 Limitations and Delimitations of the Study

The study had a limited scope of population restricted to TTIs in only two counties (Nyeri and Nairobi counties) in Kenya. The study area covered two counties Nyeri and Nairobi Counties in Kenya that are not close to each other in terms of location. The TTIs are not also located within the same sub-counties. Collecting data from all TTIs in both counties posed a challenge to the researcher. To overcome this limitation, the researcher engaged two qualified research assistants who assisted in questionnaire distribution and picking as the researcher conducted interviews with Bursars and Principal.

In addition, the respondents appeared to conceal information regarding the level of ICT integration in their institution for fear of exposing TTIs ICT related matters, thereby making it difficult for the researcher to gather information. However, this challenge was addressed through the introduction of the researcher by the respective Deputy Principal for Academic Affairs who assured respondents about authorization to collect data, voluntary participation, confidentiality of the data collected and that they allowed to withdraw from the study without any notice and at any stage.

Some of the respondents were also not very familiar with ICT terms which could have led to subjective responses. To overcome this limitation, the researcher and the research assistants ensured that they have clearly explained all the ICT terms used in the questionnaires and interview guides. Additionally, the study also had limited time and budget scope to allow the researcher conduct a comprehensive analysis that would have engaged the students in all the TTIs. To address this limitation, further studies should consider to assess ICT integration in TTIs from a student's perspective.

1.13 Operational Definition of Terms

Administrative functions: refers to daily TVET institutional operational activities especially in managing information about students, staff and resources

Assessment practices: Process of examining the learning and academic achievement of learners in order to facilitate decision making about their academic progress

Competency Based Training: This refers to the system of instruction whose focus is acquisition of knowledge and skills to perform set functions

21st Century Skills: refers to core competencies such as communication and collaboration, digital literacy, critical thinking, learning to learn and problem solving necessary for learners to thrive in the contemporary society

Digital technologies: are defined as any technology controlled using computer hardware, software digital media or devices digital logs

Financial management: refers to the aspect of financial planning, control and budgeting processes in a TVET institution

Instructional processes: Teaching and learning activities performed in the TVET

institutions

Information and Communication Technology: refer to any device that can store, retrieve, manipulate, transmit and analyze information electronically

Integration of Information Communication Technology: the use of a range of ICT software and devices in offices as well as in pedagogy to support institutional management and promote student learning and acquisition of skills.

Technical Vocational Education and Training refers to the education, training and learning activities that are geared towards acquisition of knowledge, skills and understanding relevant to gainful economic activity

Technical Training Institutions refer to the public Technical Training Institutes and National Polytechnics that offer technical vocational education and training

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of literature pertinent to the study. The review is presented from the general to specific studies contextualizing the international, regional, national and local perspectives relevant to this study. In particular, this chapter presents the historical perspective of TVET, general perspective of ICT integration in TVET institutions and literature on levels of ICT integration in administrative functions, financial management, instructional processes and assessment practices. A summary of literature reviewed and analysis of the knowledge gap are also presented.

2.2 Historical Perspective of TVETs

Technical and Vocational Education and Training (TVET) is a form of education that imparts practical skills and knowledge necessary for employment within specific industries. The historical origins of TVET can be traced back to the Industrial Revolution, which created a demand for skilled workers capable of operating and maintaining machinery. As time progressed, TVET programmes adapted to cater to the evolving requirements of the economy. Across different countries and periods, various terms have been utilized to describe components of the field that are now recognized as integral to TVET (Owais et al., 2020). These terms encompass apprenticeship training, vocational education, occupational education and training, as well as careers in technical education.

At the second international congress on technical and vocational education held in the

Republic of Korea in 1999 (Abd Rashid et al., 2016), UNESCO and ILO, in consultation with their respective member states and partner agencies, jointly agreed to use the term TVET in the future to unify the field. In a global context, TVET has been recognized as a key factor in economic development and poverty reduction. The United Nations Educational, Scientific and Cultural Organization (UNESCO) has been promoting TVET since the 1950s through the World Technical Education Conference. In 2015, the United Nations adopted the Sustainable Development Goals (SDGs), including SDG 4 on Quality Education, which emphasizes the importance of TVET in promoting lifelong learning and skills development.

Owais et al. (2020) argues that TVET first emerged in the context of the industrial revolution in Europe and North America as part of the philosophy of productivism. During the Industrial Revolution, vocational education programs were established to train skilled workers capable of operating newly developed technologies. These programs aimed to train individuals for specific trades, such as blacksmithing, carpentry and masonry (Ertl, 2015). The focus was on providing practical training that would enable individuals to contribute to economic growth.

Furthermore, in Europe, there are two main types of national traditions regarding TVET. Some countries socially discredited TVET, including France, Spain, Italy and the UK, while others like Germany, Australia and the Netherlands embraced it (Wolf, 2020). This led to Germany's TVET becoming closely associated with the needs of the business community, although the efficiency of the apprenticeship system is being questioned today (Yamada, 2019). There is an increasingly strong connection between employment and training, to a certain extent linked to work and training schemes.

In the 20th century, there was a growing recognition that individuals needed both practical skills and academic knowledge to succeed in the workforce. This led to the integration of academic and vocational education in TVET programs. For example, the Smith-Hughes Act of 1917 in the United States provided federal funding for vocational education programs that emphasized both practical training and academic instruction (Larson & Soria, 2016).

In Africa, TVET differs from country to country and is delivered through various types of institutions, including technical and vocational schools, polytechnics, enterprises and apprenticeship training (Yamada, 2019). In West Africa, traditional apprenticeship offers the largest opportunity for acquiring employment skills in the informal sector, while formal TVET programs in sub-Saharan Africa are school-based (Needham, 2019). TVET systems in Africa are undergoing promising reforms designed to build on the inherent strengths of the system and address the challenges of the 21st century. Regionally, TVETs are recognized as a way to tackle youth unemployment and promote economic growth.

In Africa, TVET has undergone significant changes over the past century. The focus has shifted from basic vocational education to higher levels of technical and professional education. African countries have invested in TVET programs to bolster their economies and global competitiveness (Eaton & Sayed, 2015). In 2002, the African Union adopted the African Union Strategy for Technical and Vocational Education and Training, aiming to enhance the quality and relevance of TVETs on the continent (AU, 2002). Despite these efforts, TVETs in Africa still face challenges such

as inadequate funding, outdated curricula and a negative perception of technical and vocational education.

In Kenya, TVETs have a long history dating back to the pre-colonial era, when young people were trained in traditional skills like carpentry, metalwork and weaving. During the colonial period, technical schools were established to train Africans for manual labour jobs. After independence, the Kenyan government established the Directorate of Industrial Training in 1964, which was later replaced by the Technical and Vocational Education and Training Authority (TVETA) in 2013.

According to Omolo(2013), formal skills training in Kenya started in 1924 with the establishment of the native industrial training depot in Kabete. Catholic missionaries established trade schools in Kaiboi and Mawego. Courts established Thika, Machakos and Sigalagala Institutions to offer 2-year post-primary artisan training, which later converted to National technical secondary schools and eventually upgraded to TTIS in 1985.Furthermore, TVET programmes have undergone significant changes over the past few decades.

In the 1980s, it became evident that TVET programs needed to provide specialized training to meet evolving economic demands. The Kenyan government established the Directorate of Industrial Training (DIT) in 1986 to oversee the development and implementation of TVET programmes (Wamalwa & Khayesi, 2017). In recent years, the Kenyan government has made substantial investments in TVET, aiming to enhance access to high-quality technical and professional education. In 2013,a TVET reform program was launched to modernize and expand TVET programmes across the

country. This program focused on improving the quality of TVET programmes, expanding access for marginalized and underserved populations and strengthening partnerships between TVET institutions and industry (Republic of Kenya, 2013).

The Kenya Government launched Vision 2030 and formulated the Technical and Vocational Education and Training Policy to guide the revitalization of the TVET sector and produce skilled, employable graduates needed to fulfill the goals of Vision 2030 (Malechwanzi, 2022). Specific emphasis was placed on enhancing access to TVET,targeting an ambitious gross enrollment rate of 30% by the year 2030 and ensuring relevance in the training provided (Ministry of Higher Education, Science and Technology, 2012).

Kenya's Youth polytechnic programmes provide non-formal training to unemployed school-leavers in skills related to local income-generating opportunities (UNESCO, 2014). Within the informal sector, a training system based on the apprenticeship model thrives. It is estimated that this sector provides training to more youths than all the formal sectors combined (Ferej et al., 2012).

However, despite the successful expansion of TVET over the past two decades since 1990, their programmes have not met the expected level to achieve their objectives, as noted by Patrick et al. (2015). Enrollments are skewed towards more academic programmes like ICT, human resources, accounting, management and other business courses. Enrollment in more practical courses, mainly offered by youth polytechnics, such as mechanical, automotive and building construction trades, is much lower (Ferej et al., 2012). Therefore, integrating ICT into youth polytechnics will likely promote

more enrollments in practical courses and ensure effective training and completion of these programmes.

In a study by Patrick et al. (2015) in West Pokot County, it was found that YPs operate without a clear curriculum and are characterized by low participation rates and gender inequalities due to inadequate and relevant materials as well as insufficient and poorly trained staff. Training quality fell below expected levels and funding remained a significant disincentive in implementing YPs curriculum. In a study conducted by Kamau (2013) in Kiambu County, principals and teachers complained about reduced government funding, and a weak curriculum .

2.3 ICTs Integration in TVET

The rapidly changing and interconnected world makes it essential for TVET to provide learners with adequate skills and competencies to cope with the social and professional realities of the 21st-century knowledge-based economy (OECD, 2015). Scholars in education view ICT as having the capability to provide a dynamic and proactive administrative, teaching and learning environment in TVET institutions, leading trainees to acquire relevant skills for the 21st century (Sarkar, 2012). In line with the current digital era, TVET institutions are required to integrate ICT into their daily activities and replace traditional methods of administration and teaching with modern tools and facilities.

ICT provides an array of powerful tools that can help transform the present isolated teacher-centered and text-bound classroom into technology-enriched, student-focused and interactive knowledge environments (Anita & Smiriti, 2013). Traditional education

approaches are not well-equipped to cope with the development of modern ICTs (Fraillon et al., 2020). This has prompted various governments, NGOs and academic institutions to make significant investments in computer-based ICT to support the teaching and learning process (Almadhour, 2010).

The main goal of ICT integration in TVET is to enhance the quality of TVET outcomes. Information Technology has become an integral element of education and innovation that expands access to education (UNESCO, 2013). Therefore, it is important to establish the integration of ICTs in teaching and learning in TVET as a precursor for enhanced access. Research has shown that ICT can lead to improved student learning as well as better pedagogical practices. Aktaruzzaman and Clement (2011) posit that when used correctly, ICT leads to the expansion of education in the digital workplace, enhanced learning management systems and makes education management affordable and accessible anytime, from anywhere.

There is a need to explore ways to improve the pedagogical readiness of TVET trainers to meet the changing skill demands of the digital society of the 21st century (Alemu, 2015). Pedagogical readiness relates to the teacher's ability to design ICT-enabled learning experiences, which is the focus of school professional learning strategy (Maina et al., 2016). Additionally, trainers are required to identify what types of ICT work best for developing specific TVET students.

There has been a general lack of an integrated ICT pedagogy within the TVET curriculum, leading to lecturers using outdated methods (Mwangi & Khatete, 2017). ICT integration in teaching and learningcontributes to powerful learning environments

and enables students to acquire knowledge actively in self-directed and constructive ways (Luhamya et al., 2017). Coleman (2016) indicated that ICT transforms the classroom from being teacher- centered to student-centered. Therefore, all avenues should be used to foster integration.

As ICTs make their way into the education environment, it may become difficult for training and learning activities, especially in TVET instruction, to remain unchallenged. The task of using ICT has become a priority for governments (UNESCO, 2012). The Education 2030 Framework for Action recognizes ICT as an essential tool for strengthening education systems and enhancing quality and effective learning (UNESCO, 2015). The need for rethinking TVET is clearly illustrated by this framework and Sustainable Development Goals (SDG) 4.3 and 4.4, which aim to increase the number of youths and adults with relevant skills for employment, decent work and entrepreneurship. ICT is seen to have the potential to create transformative changes in skills development and TVET (Saina et al., 2018).

This goes beyond the traditional view of enhancing access only. According to UNESCO (2017), the integration of ICT in TVET leads to: reflective learning and knowledge creation, ubiquitous lifelong learning, learning engagement and social learning and authentic and simulated learning. Research conducted in the Asia Pacific region on the extent of ICT integration in four key domains of leadership readiness, teacher readiness, student readiness and infrastructure readiness revealed that ICT integration in TVET was at an advanced stage(Majumdar, 2017). This implies that most students and teachers were more willing to use ICT in their teaching and learning practices.

Various TVET organizations differ in terms of ICT infrastructure, which is the main focus of this study, to assess the extent of ICT integration in TVET institutions in Nyeri and Nairobi counties.

UNESCO (2015) provides a 4-stage model for measuring the extent of ICT integration, including emerging, applying, infusing and transforming stages. The emerging stage is initiated and driven by management with a focus on establishing the physical infrastructure that teachers make use of. The applying stage enables teachers to use specific software and tools to supplement traditional classroomteaching by drawing, designing and modeling (Mirzajani et al., 2016).

In the infusing stage, various ICT tools are integrated across the curriculum, enabling inter-disciplinarylearning (Mwangi, 2016). The ICT tools used at this stage include multimedia, simulation and modeling software (Vorster & Goosen, 2017). The transforming stage is characterized by the ubiquitous use of ICT for management, productivity and in thecurriculum. Teachers are confident users of ICT and are capable of designing learner- centered lessons.

The figure below shows a four-stage model for measuring the level of ICT integration (UNESCO, 2015).

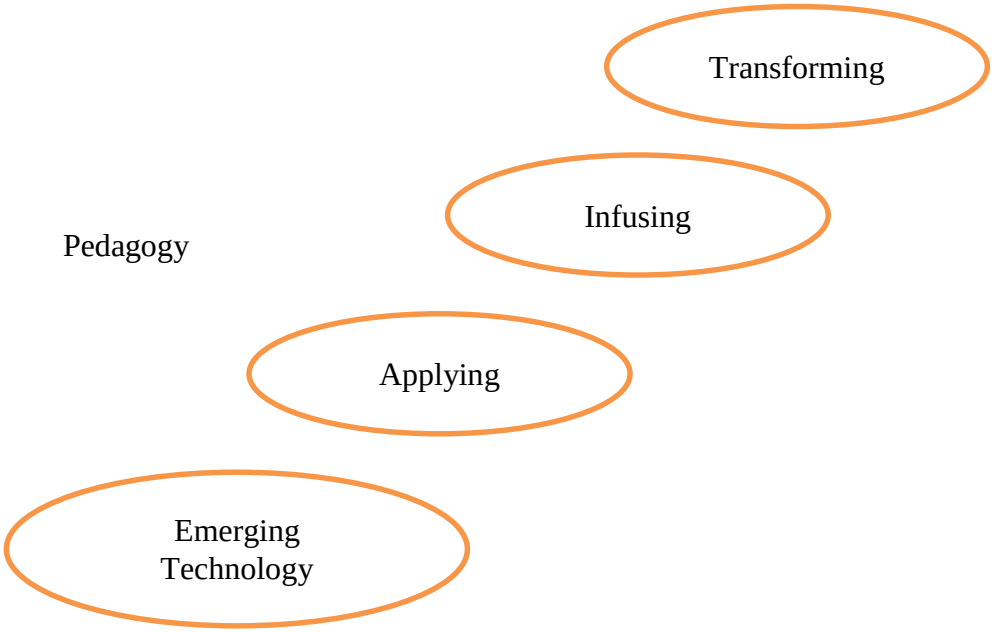

Figure 2.1: Levels of ICT Integration

Source: UNESCO 2015

Various researchers in educational technology, specifically focusing on the use of ICT in teaching and learning, have applied various theories in their research. These theories include the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Technology Organization Environment (TOE) framework, the Theory of Planned Behavior (TPB), the Unified Theory of Acceptance and Use of Technology (UTAUT) and Technological Pedagogical Content Knowledge (TPACK).

Considering the significant effort directed towards the successful use of ICTs in teaching and learning, several policies have been developed to encourage teachers to adopt appropriate pedagogical practices to align with the digital world (Fu, 2013).

2.4 ICT and General Education

ICT plays a critical role in addressing access and equity issues in education. ICT is a powerful tool with the potential to transform the educational opportunities and life chances of many students, including those excluded due to their special circumstances and special educational needs (World Bank, 2016). The adoption of ICT in education is perceived to reduce discriminatory communication patterns based on physical and social cues such as gender, race, socioeconomic status and physical features (Palvia et al., 2018). Economically, the productivity gains in many developed world economies over the past decade can be largely attributed to ICT (Shukla & Yadav, 2019).

Similarly, ICT has the potential to unlock the economic potential of developing countries and improve efficiency and accountability in governance (Naidoo & Dawuwa, 2019). The present challenge faced by education policymakers worldwide is to transform education institutions and current schooling practices to align with the rapidly growing demands of globalization and the technology-driven world. In America, the centrality of ICT in providing quality education has been captured in the "No Child Left Behind" policy (NCLB). This policy aimed at ensuring that all students score above proficiency levels by the year 2013-2014 and provide efficient and cost-effective education to all (Remington, 2018).

Notably, virtual learning programs in theUSA have dramatically expanded secondary education tenfold between 2001-2007 (Hutton & Dixon, 2016). ICT has also been associated with rapid industrial takeoff in Asian countries such as Japan, Singapore, Malaysia and South Korea. According to UNCTAD (2017), the heavy presence of ICT infrastructure in Asian countries boosts ease of doing business, increases

productivity and allows efficient monitoring of business progress, which has been critical for foreign investment and building a knowledge-based economy. Particularly in South Korea, one of the leading countries in the use of ICT in educationand industry, the economy has transformed from a poor country in the 1970s and 1980sto an industrial power whose economy ranks 3rd in Asia and 15th in the world (Baek, 2013).

In Africa, the potential for ICTs to transform the productive capacities of developing nations and governance has been recognized (Asongu & Le Roux, 2017). ICT has been leveraged to address several challenges facing the continent, including poverty, lack of access to healthcare and education. Although Africa has the lowest level of ICT penetration globally according to the International Telecommunications Union (ITU), mobile telephony has witnessed significant growth, with mobile subscriptions increasing from 6.1% in 2005 to 44% in 2019 (ITU, 2020).

The growth of mobile technology has provided an opportunity for ICT to be used as a tool for development. UNCTAD (2017) notes that ICTs offer special opportunities to stimulate growth and increase innovation in every local setting, enabling individuals and institutions to interact more productively with the global economy and the wider world. However, evidence of the impact of ICT on economic development is limited, attributed largely to poor physical and ICT facilitation (Niebel, 2014). Nevertheless, ICTs can change how development activities are performed and accelerate the realization of development goals within TVET institutions.

A study conducted in Nigeria by Ukeli et al. (2016) concluded that although there is little empirical evidence about the benefits of ICTs in Nigeria in the literature, ICTs

have great potential for enhancing people's daily lives. This is by increasing access to information relevant to their economic livelihood, better access to other information sources, healthcare, transport, distance learning and strengthening kinship ties. In Zimbabwe, the government has been keen to embrace ICT to improve efficiency in managing learning institutions. However, only schools with financial resources have been able to integrate ICT into their operations (Sibanda et al., 2016). Education reforms introduced in 2005 in Sudan aimed to incorporate ICT, especially in teaching methodologies, which has been practically implemented only in limited institutions.

East African countries are keen to embrace technology, which can potentially be an important agent of development (Guta, 2021). Since education has been identified as one of the sectors that can facilitate ICT integration in other sectors, the formulation of specific ICT education policies is crucial as they outline action plans at the institution level (Mwenisongole et al., 2020). In the Republic of Tanzania, there has been a host of activities in recent years aimed at incorporating ICT into the education sector. ICT integration in public schools remains a challenge. Malero et al. (2015) contend that the adoption of ICT has been positive in private schools mainly centered in urban areas.

In Kenya, the government has recognized the importance of ICT in the nation's development processes over time. This is articulated in ICT-related policies formulated to guide the use of ICT in various sectors of the economy, including education (Chemwei et al., 2014). In 2006, the government designed a national ICT policy aimed at improving the livelihoods of Kenyans by ensuring the availability of efficient, accessible, reliable and affordable ICT services.

Many scholars acknowledge that technology integration in education has a positive impact on student learning outcomes. In 2016, a study evaluated the impact of technology integration on student engagement and achievement in two different countries. Accordingly, technology integration had a greater impact on student engagement and achievement in the United States compared to China. However, it's worth noting that cultural factors play a significant role in the effectiveness of technology integration in education.

The findings of this study align with the growing trend towards the use of technology in education. Nevertheless, it's important to note that the effectiveness of technology integration may vary depending on the specific context and nature of implementation. The ICT national policy emphasizes on telecommunications and broadcasting (Agufana et al., 2018). Among the range of ICT uses in the education sector, a major focus outlined in the policy is the government's commitment to encourage the use of ICT in managing schools, colleges, universities and other educational institutions in the country to significantly advance the quality of teaching and learning.

The Ministry of Education developed the Kenya Education Sector Support Program (KESSP) in 2006, which identified ICT as one of the key areas of enhancing teaching and learning processes (Maina et al., 2017). The National ICT Policy embedded this priority as a national focus and provided the Ministry the impetus to advance its sector policy on ICT in education.The ICT Education policy document consists of several components: digital equipment,connectivity, network and infrastructure, equity and access, harnessing emerging technologies, technical support, maintenance, digital content, integration of ICT ineducation, capacity building , professional development

and research development (Ramadan et al., 2018). The Ministry of Education was tasked with leading the monitoring and evaluation of the education sector policy implementation, guided by both government education policies and ICT policies. Additionally, evaluation is guided by strategic documents for policy implementation as well as globalcommitments outlined in Education for All (EFA) and the Millennium Development Goals (MDGs). The proposed research focuses on evaluating ICT implementation in TVET institutions.

The Kenya Vision 2030 (ROK, 2015) underscores the centrality of ICT in providing quality education in its specific objectives, aiming to modernize teacher training and strengthen partnerships with the private sector, donors and communities to develop ICT literacy among educators. The Vision 2030 recognizes the role of science, technology and innovation (STI) in a contemporary economy, where new knowledge plays a fundamental role in wealth creation, social welfare and international competitiveness (Deya, 2016). The vision also identifies a dynamic ICT infrastructure as crucial for effective knowledge manipulation and innovation (Jared, Oloko & Orwa, 2017).

To this end, the government has partnered with organizations such as NEPAD, USAID and JICA to equip schools with digital materials.In addition to launching ICT flagship projects in its social pillar, the Vision 2030 recognizes the need to enhance the pool of talent, which is comparatively small and inadequately trained for integration into the job market (Maina et al., 2017). The Vision focuses on spurring measures to improve the national pool of skills and talent through training relevant to the economy's needs (ROK, 2015).

As a result, the Government andMinistry of Education in the National Development Plan proposed developing an Information and Communication Technology (ICT) syllabus for primary and secondaryschools. The government aimed to initiate an ICT in-service teacher training program to train 43,000 primary and secondary school teachers by the end of 2008 and achieveuniversal primary and secondary student ICT literacy by 2015. However, Wilberforce (2017) argues that apart from acquiring digital materials and ICT competencies, understanding the extent of implementation effectiveness is necessary as policy and practice often diverge.

2.5 ICT Integration in Context

Education For All and the Millennium Development Goals did not adequately account for TVETs in their formulation. In the second decade of the 21st century, TVETs began to garner international attention (Mwangi, 2016). In addition, the African Union Agenda 2063, which included the development of a continental strategy for TVET, will serve as an effective action plan to address the growth potential of TVET institutions in Africa. The strategy will provide a comprehensive framework that considers crosscutting issues of employability, relevance, collaboration between training institutions and employers, accreditation of training structures in both non- formal and informal sectors, evaluation and certification, quality assurance and portability of TVET qualifications at international levels.

As a result, TVETs have recently become a target for reform, in which ICT plays a salient role. Since the ThirdInternational Congress in Shanghai in 2012, UNESCO has been calling for a transformation of TVET systems to ensure they have the capacity to respond to the multiple demands placed on them due to constant and rapid economic,

social, geopolitical and technological changes (UNESCO, 2013). Development of skills for livelihoods is now a key priority for most governments to date. Consequently, TVET ismore important worldwide than ever before (Latchen, 2017). Moreover, it has been shown that a quality TVET programme plays an essential role in promoting a country's economic growth and contributing to poverty reduction, as well as ensuring the social and economic inclusion of marginalized communities.

Indeed, the development of TVETs has been identified as central to the achievement of SDGs (Tok & Sora, 2013). Specifically, SDG four aims to ensure inclusive and equitable quality education and lifelong learning opportunities for all and to substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship by 2030 (UNESCO, 2017). To achieve these noble socioeconomic goals, the use of ICT to facilitate novel forms of open, flexible and technology enhanced learning in TVETs has been identified as a key strategy in many countries worldwide.

An evaluation of ICT in initial VET in Europe in 2005 showed that almost all member states emphasize the integration of ICT into TVET and/or the education system in general (Picatoste et al., 2018). However, the extent to which this is being implemented varies. It is a major priority for Germany, Austria, Sweden and Finland, where national funding reflects the political rhetoric. The authors note that the lack of a national policy and strategy may affect the extent to which ICT is integrated into TVETs (Pradhan et al., 2020). Additionally, a survey by the EU in 2015 showed that the development of ICT in TVETs is closely connected with broader issues such as the evolution of the information society, the lifelong learning paradigm and the general development of

secondary education.

In Germany, the ICT policy framework has catapulted TVETs to a critical position towards achieving sustainable development supported by requisite industrial skills in informal and non-formal learning (Latchem, 2017). The ICT policy framework aims to ensure that learning is transformative to enable learners to make their own interpretations rather than act based on the beliefs, judgments and feelings of others, fostering independent and autonomous thinkers (Kanwar et al., 2019). On the other hand, TVET institutions are expected to act as tools for societal integration and cohesion. TVETs should encourage flexible access to lifelong learning, training and enable all societal members to receive career assistance and counseling (Khan et al., 2016). However, Abdi et al. (2016) noted that many TVET systems and models lack explicitmechanisms for lifelong learning.

In Africa, the importance of skills development for social and economic growth, particularly for promoting youth employment and decent work, has led to increased interest in the formulation of skills development policies. At the 2008 International Labour Conference, the ILO's tripartite constitution of governments, employers and workers adopted a set of conclusions focusing on how investment in education and skills can help economies achieve dynamic growth with quality jobs. The Decent Work Agenda for Africa 2007-15 set a target for three-quarters of African countries to reform their skills policies by 2015 (ILO, 2015).

A notable recommendation was to reform TVETs to make them more relevant to modern labor requirements using ICT. Similarly,the Southern African Development Community

(SADC) has recommended its MemberStates, in the strategic framework for 2012-16, to develop a Technical Vocational Education and Training (TVET) Policy in which ICT is to be considered. However, policymakers in various countries are grappling with the challenge of identifying effective policies and strategies for skills development and want to learn from the policies and experiences of other countries. As a result, TVET policy and practices, especially concerning ICT, are often reported to be at variance (UNESCO, 2013).

Ghana does not have a specific ICT policy for TVETs. However, ICT integration action plans for TVETs are embedded in the National ICT Policy for Accelerated Development policy. The cabinet approved the policy to improve socioeconomic development through accelerated development to improve the information society and cultural well-being (Republic of Ghana, 2013). This has led to a substantial provision of ICT facilities in Polytechnics. However, a low level of integration of ICT has been reported.

In Nigeria, a key development has been the Ministerial Strategic Plan 2016-2019 (FMOE, 2015). This Plan is built around three result areas of access, quality and systems strengthening and comprises ten pillars spanning all levels of education. The access result area includes the pillars of out-of-school children, adult literacy and TVET. The Act established the National Board for Technical Education, which is tasked with coordinating all aspects of technical and vocational education falling outside university education. According to UNESCO (2018), in a bid to improve the quality of TVET education, the board has recommended ICT to make TVET courses more relevant and responsive to industrial development and labor needs. As a result,

Polytechnics have received digital equipment coupled with teacher training.

In Botswana, due to the lack of adequate policy direction, development in TVETs has been slow. Moreover, ICT development in TVETs, especially in distance and open learning, is the responsibility of the Distance Education Programme, considered as an arm of the Botswana Department of Non-Formal Education (UNESCO, 2013). However, the Government of Botswana is planning to introduce several new TVET programs as well as construct several new TVET institutions. In Zambia, there are clear policy intentions on the integration of ICT in TVETs. This is outlined in the TEVET policy adopted in 2008, in which ICT has been identified as the strategy to increase enrollments in the TEVET colleges, especially through e-learning (MOEST, 2014).

However, due to reported weaknesses in ICT infrastructure, the policy goals have not been attained. In Tanzania, ICT integration in the management of TVETs is anchored in the National Policy on ICT (Mmari et al., 2022). However, ICT infrastructural problems have hindered ICT takeoff in TVETs.

In Kenya, TVETs have now been positioned as strategic to the achievement of Vision 2030 as well as the Big Four Agenda. TVET institutions started receiving significant digital support, especially after the enactment of the TVET Act (ROK, 2013). This elevated TVETs to significant pillars of socioeconomic development to drive Kenya to a middle-income economy by 2030 (Agufana et al., 2018). Regarding ICT integration in Technical Training Institutions in Kenya, a draft ICT trainers' competencies framework and e-resource Centre have been established. Eight (8) technical institutions have started offering Cisco Networking Academic Programs meant to provide trainees

with an industrially valued certificate in skills to repair and maintain computers (Konayuma, 2015). A sensitization workshop and training of teachers on the application of ICT to teaching have been conducted. By 2014, 43 TVETs had received digital supplies (Ministry of Education of Kenya, 2014). However, the current status of ICT facilities and levels of digital adaptation remain largely unexplored.

2.6 Status of ICT Facilities in TVETs

Facilities required for ICT integration include the provision of adequate desktops, laptops, digital cameras, local area networking, the internet, websites, CD-ROMS, DVDs and applications such as word processors, spreadsheets, simulations, email, digital libraries, Skype and interactive social sites that include Twitter, Facebook and YouTube, to mention a few. It also includes technical support, maintenance and access by the users for effective adoption of ICT in teaching and learning (Afzaal, 2012; Kazi, 2012).

According to Fernández-Portillo et al. (2020), studies in the Netherlands, the United Kingdom, Malaysia and Turkey confirm the fact that school educators require facilitation with appropriate computer facilities and related infrastructure to optimize the application of ICT in their teaching and administrative engagements. This has been attributed to the perceived significance of ICT in education and industrial development, as evident in Singapore, South Korea and Malaysia (Abubakar, 2016). On the other hand, Odera (2011) observes that many countries in the developing world have limited experience with the effective use of education management information systems (EMIS) due to limited facilities. Moreover, Kukali (2013) maintains that in developing countries, most rural and informal urban settings may lack electricity and internet

connections, as well as the capacity to meet maintenance costs. Further, Kiboi (2014) notes that availing of digital equipment is not enough and the equipment must be maintained with the requisite technical support.

Hoque et al. (2012) examined ICT utilization among school teachers and principals in tertiary institutions in Malaysia. The objectives relevant to the proposed study were to examine the extent to which the institutions are equipped with facilities and access to teachers for pedagogy and the extent to which teachers and principals use ICT in the management of the schools. Data was collected using questionnaires and document reviews. The data was analyzed and presented using bar graphs. The findings indicate the majority of schools are well and adequately equipped with ICT facilities. However, the findings indicated that ICT was mainly used for administrative purposes and teacher preparation rather than imparting skills to learners. There is a need to examine whether the same applies to Kenya, considering heavy investments in ICT equipment.

In Africa, most governments have liberalized and invested huge portions of their annual budgets in ICT (UNESCO, 2015). The main focus has been to transform education through ICT, which is generally perceived to catalyze social and economic development through industrial and technological takeoff (UNESCO, 2015). Moreover,ICT has also been identified as a key priority area for promoting conducive conditionsfor education and sustainable development (Abuya, 2014). Facilitation of ICT in schools has also been identified as instrumental in bridging both quantitative (access) and qualitative (standards) gaps, especially in secondary and tertiary education (Amukhuma, 2018). However, Sub-Saharan Africa has been grappling with ICTinfrastructural challenges despite commitments for the same (Onguko, 2016). Many attempts to equip learning

institutions with ICT devices as well as teacher training haveoften not been accompanied by adequate research or tracking of on progress of ICT policy implementation.

In Nigeria, Kennedy et al. (2017) analyzed the challenges of technical vocational teacher education and teaching in Nigeria. The study was informed by the need to equip technical teachers with ICT skills for effective ICT management practices in TVETs. The study findings indicated the teacher training colleges are poorly funded, the ICT equipment is inadequate and the internet supply is lacking. Yet, the teacher trainees are expected to adapt to ICT, especially in pedagogy once they are posted to technical schools. The study concurred with a report prepared by Osei (2007), who cited a lack of electric power and telecommunications infrastructure as an impediment to ICT adaptation in education institutions in Ghana (Amedeker, 2020). However, in each study, the data was content analyzed, which limits generalizations to other situations.

Likewise, in Ghana, Osei (2019) employed a cross-sectional survey approach to assess the availability and use of ICT facilities in technical and vocational education and training (TVET) institutions in Ghana. The results revealed that, while ICT facilities were available in most TVET institutions, their utilization was low due to inadequate training and limited access to the internet. The study also found significant differences in the availability and use of ICT facilities across regions and types of TVET institutions. Therefore, they recommended that TVET institutions prioritize the training of instructors and students in the use of ICT facilities and improve internet access to enhance their utilization. However, the study failed to explore the perspectives of TVET stakeholders, such as industry partners and policymakers, on the role of ICT facilities in TVET. The current study explores these perspectives to provide a more

comprehensive understanding of the use of ICT in TVET.

Rwanda, in her quest to become a regional ICT hub, has made ICT a dominant feature of her current education policies (Mugiraneza, 2021). As a result, there have been efforts to develop a great ICT asset base, especially in learning institutions. To this end, Lim (2017) examined Rwanda's capacity for ICT in technical education. The study was exploratory, in which data was collected from students and teachers using semi-structured interviews and observation. The study reported that despite ICT equipment availability, internet connectivity was very poor, especially in rural areas. The ICT infrastructure is largely well established in the institutions that are within the precincts of urban areas such as Kigali. In Kenya, Nairobi County is a city, while Nyeri County is largely rural. There is a need to compare the two counties in terms of ICT facilitation.

In Sudan, the government recognized the role of implementing ICT in educational institutions, both secondary and tertiary. This is detailed in the government's national ICT plan. Ahmed (2011), Ramadan (2018) and Chen (2018) carried out a study on teachers' perceptions of the integration of ICT in TVETs. One of the objectives sought to examine teachers' perceptions of the status of ICT equipment. The data was collected by interviewing teachers in Khartoum State. The findings of the study indicated poor ICT infrastructural development in TVETs as well as a lack of technical support in maintaining available digital equipment. The study concurs with the views of Elemam (2016), who pointed out that the same problem is replicated in secondary schools despite having benefited earlier in terms of policy support. There is a need to examine whether the same applies to Kenya, considering efforts made to implement ICT policy practices.

Ramadan and Chen (2018) evaluated the availability and use of ICT facilities in TVET institutions in Kenya and identified the factors that influence their adoption. The study employed a mixed-methods design and collected data from 367 TVET instructors and 650 students from seven counties in Kenya. Data was collected using a survey questionnaire and interviews and analyzed using descriptive statistics and content analysis. Based on the study findings, while most TVET institutions had ICT facilities, their utilization was limited due to inadequate infrastructure, limited funding and a lack of technical support. The study also found that factors such as gender, age and experience of instructors influenced their use of ICT in teaching.

It was therefore recommended that TVET institutions prioritize the provision of infrastructure, funding and technical support to enhance the use of ICT in teaching and learning. Additionally, training programs were ideal to equip instructors with the necessary ICT skills. However, they failed to use any standardized assessment tools to measure the use of ICT facilities or the quality of teaching and learning outcomes. Kiboi (2014) sought to examine the status of ICT equipment in relation to function, maintenance and technical support in institutions that have received donor funding for ICT facilities.

The study focused on teacher training colleges that received support forICT equipment and training from USAID (MOE, 2012). Data was collected using questionnaires, interviews and observation. The findings indicated that the donated ICT equipment was in good condition and accessible but was not adequate as the colleges were not buying more. Further, technical support was not adequate, which translated to low integration of ICT in the management, contrary to expectations. Thereis a need to find out whether

the same applies to TVETs, which have equally received support to put up ICT infrastructure.

A study closer to the proposed study is by Chepkoech and Mwinzi (2016). They sought to determine the types of facilities used by students for effective learning and self-ddevelopment that gear towards accelerated development and the extent to which students appreciate the use of these facilities in their studies. The study was carried out in four public TVET institutions in Vihiga and Kakamega counties. Primary data was collected using questionnaires, observation and interview schedules. The data was analyzed using graphs and tables, as well as percentages. The study found that there should be an enhancement in the provision of ICT facilities such as audio-visuals, application software and networking facilities, which are still a challenge in the institutions. However, the study was descriptive in nature and no attempt was made to examine relationships among variables.

2.7 Integration of ICT in Administrative Functions

Numerous organizations have embraced information and communication technology (ICT) as a strategy to navigate through tumultuous environments. As indicated by Sharma (2015), information technology entails interconnected components collaborating to gather, process, store, distribute information, support decision-making, coordination, control, analysis and visualization within an organization.Consequently, educational administrators and educators worldwide are compelled to meticulously assess the academic and social requirements of their students, where ICTcan play an impactful role (Lawrence & Tar, 2018). Notably, ICT is anticipated to be adriving force in the reform of Technical and Vocational Education and Training (TVET) institutions,

enabling them to contribute to the transformation of global economies. This encompasses the optimization of technology to enhance the management of educational institutions across administrative, instructional and financial phases (Maina, 2018). This strategic application can be pivotal in the processes of planning, standard-setting, facilitating change and monitoring core functions.

Globally, educational administrators and educators face the obligation to intricately scrutinize the academic and social needs of their students, wherein ICT can play a pivotal role in this requirement. Deya (2016) and Maina (2018) are in agreement regarding the increasing complexity of administrative functions in schools, driven by factors like enrollment dynamics, population mobility and social challenges. Addressing this complexity necessitates the utilization of robust administrative tools, leading to improved communication, streamlined operations and enhanced personalized services.

One such tool is the computer. As per Sharma (2015), ICT assumes a critical role in enabling potent and efficient administration within the educational sector. Its applicability ranges from managing students, staff, fostering engagement with institutions and communities within the educational landscape. Administration is a social process encompassing categorization, preservation, motivation, direction and amalgamation of formally coordinated human and material resources within a cohesive setting specially designed to attain predetermined goals and objectives (Soneye, 2012).

Administrators leverage ICT tools to convey instructions and provide organizational training in an engaging manner. As discovered by Mwalongo (2011), administrators

adopt ICT tools for functions such as creating organizational announcements, preparing documents for meetings with clients, studentenrollment and registration, instructor coordination and staff recruitment. Ifadministrators adeptly adopt ICT tools, they can utilize them in decision-making processes based on systematically stored and retrievable data.

In a study by Pavlova (2018) concerning the computerization of school administration and its impact on principals' roles, particularly in a Singaporean school, it was observed that ICT streamlined administrative processes, particularly in communication. Previously, teachers consulted cumbersome logbooks to ascertain room availability and bookings. However, with ICT, they gained access to a month-long schedule, allowing them to identify room occupancy and potential vacancies. Furthermore, ICT emerged as a crucial tool for information dissemination (Kanwar et al., 2019). It facilitated the communication of available information to staff immediately upon logging in, enhancing their awareness and enabling timely actions.

In a similar way, Anshari et al. (2012) aimed to compare the level of ICT integration in public administration between China and Malaysia and identify the challenges and prospects for further ICT integration in these nations. Their study employed a qualitative research approach, gathering data through semi-structured interviews with 20 administrators from government agencies in both countries. The collected data underwent content analysis. The study's findings indicated that both China and Malaysia had made significant headway in integrating ICT into public administration. Notably, China was ahead in terms of e-government development. However, challenges persisted in both countries, including inadequate funding and a shortage of skilled

personnel. Additionally, the study identified several opportunities for deeper ICT integration, such as utilizing social media for public engagement and enhancing inter-agency interoperability. The findings proposed that addressing challenges and capitalizing on opportunities could yield more efficient and effective public administration. Nevertheless, the study's limited sample size raises concern. This study seeks to bridge this gap by employing a larger sample, providing a more comprehensive insight into the integration of ICT in public administration.

Kumar and Srivastava's (2018) research investigated the impact of ICT on enhancing the management of TVETs in India. Employing a quantitative research design, the study engaged in a survey of 100 administrators from TVET institutes. The results revealed a significant enhancement in the administration of TVET institutions due to ICT integration. This improvement was particularly notable in data management, communication and decision-making processes. As a result, the study recommended increased investment in ICT infrastructure, training and support services by Indian TVET institutes to fully capitalize on these benefits. Despite these advancements, a gap in the study emerged as it did not delve into the influence of ICT integration on the quality of education and training provided by TVET institutes in India.

Afzaal (2012) study explored the utilization of ICT by school administrators in managing primary schools in Brunei. The research surveyed 96 Bruneian primary school administrators, employing questionnaires for data collection and applying both descriptive and inferential statistics for analysis. The findings indicated that although there are adequate ICT facilities available, the integration of ICT into teaching and learning is still in its infancy. These findings align with UNESCO's (2017) observation

that the mere provision of ICT equipment does not guarantee its seamless integration into teaching and learning practices. Therefore, there is a need to design effective ICT integration strategies to optimize the substantial investments made in ICT. The government of Kenya's strong support for TVETs through the provision of ICT facilities are aimed at addressing the skill challenges of the modern era. Evaluating the actual utilization of ICT equipment within TVET institutions is crucial to comprehending its impact.

The study conducted by Lai and Pratt (2017) delved into the incorporation of ICT in administrative functions within a Chinese university. The authors aimed to enhance the efficiency and effectiveness of administrative processes by leveraging ICT. Employing a case study approach, the research examined the integration of ICT tools into administrative functions, including data analysis, communication and record-keeping. The study's outcomes demonstrated a widespread adoption of ICT tools among university administrators, leading to improved administrative efficiency and effectiveness. The enhanced communication and collaboration among administrators were also evident. Consequently, the study suggested continued integration of ICT into administrative functions within universities to further enhance processes and outcomes.

However, the study's limited sample size hinders the generalizability of its findings. To address this limitation, the present study will encompass a more representative sample size. Wima and Pardo (2013) study evaluated the utilization of ICTs in the public administration of the United States. The research highlighted significant adoption and implementation of ICTs, led by the federal government's strides in e-government development. Despite these achievements, challenges persisted, including ensuring the

security and privacy of ICT systems and overcoming the digital divide. The study also identified several opportunities for deeper ICT integration, such as leveraging open data and social media for public engagement. While the United States had made considerable progress in integrating ICTs in public administration, there remained room for further improvement. The study, however, lacked an in-depth analysis of the digital divide and specific recommendations for its resolution. The upcoming research aims to fill this gap by exploring the digital divide's nuances in the context of public administration in the United States and devising effective strategies to bridge this gap.

Gachago et al. (2016) conducted a qualitative analysis to investigate the adoption and implementation of ICT in South African government departments. While progress had been made in this regard, significant challenges persisted, including funding inadequacies, insufficient infrastructure and a dearth of ICT skills and training. The research also identified opportunities for increased ICT integration, such as enhancing communication and collaboration among government departments and utilizing mobile technologies for service delivery. The study's findings suggested that addressing these challenges and capitalizing on opportunities could lead to a more effective and efficient public administration. However, the study overlooked the critical issue of the digital divide in South Africa, a factor essential for the successful implementation of ICT in public administration. The ongoing study aims to explore strategies to address the digital divide and ensure equitable access to ICT resources and services.

In Zambia, Simbula (2019) research focused on the incorporation and acceptance of information and communication technology (ICT) among teachers in secondary schools in Zambia. The study centered on teachers' attitudes, beliefs and perceptions regarding the integration of ICT into teaching and learning. The findings revealed that

teachers in Zambian secondary schools exhibited positive attitudes toward the use of ICT in educational contexts. However, the adoption and seamless integration of ICT were hindered by various factors, including limited access to ICT resources, insufficient training and support and inadequate infrastructure. The study also highlighted that teachers' level of proficiency with ICT played a crucial role in predicting their adoption and integration of these technologies. Consequently, it was recommended that the Zambian government and education stakeholders prioritize the provision of adequate ICT resources and support, coupled with comprehensive training initiatives for teachers to effectively utilize ICT in teaching and learning. Notably, the study did not focus on the administrative roles within educational institutions, a gap that this research aims to address.

In Nigeria, Chidobi (2015) investigation delved into the application of ICT in the management of administrative personnel and student records within public universities in Enugu State. The study utilized a quantitative approach, employing a questionnaire to collect data from a sample size of 605 respondents comprising university academic staff and senior administrative personnel. Data analysis involved mean, standard deviation and t-test statistics using a modified 4-point rating scale. The findings revealed a deficiency in the comprehensive application of ICT in managing both administrative personnel and student records within Nigerian universities. However, the study did not provide insights into the extent of ICT integration, a crucial aspect that this proposed research aims to explore.

Juma et al. (2016) study examined into the role of ICT in higher education management in Uganda, particularly in response to the evolving dynamics of modern education,

encompassing institutions like Technical and Vocational Education and Training (TVETs). The study was conducted across four universities, involving a sample of Forty-eight (48) administrators. The data were analyzed using both inferential and descriptive statistics.The findings underscored the positive impact of ICT adoption on communication, information sharing, data management and task coordination among administrators within these universities.

However, the study did not delve into the levels of ICT integration. Furthermore, the research sample was drawn using non-probability methods, limiting the generalizability of the finding's generalizations (Asuman et al., 2018). To address this limitation, the proposed study intends to comprehensively examine the levels of ICT integration in higher education management. This study employed probability sampling methods that allowed generalizability.

Additionally, Omona (2019) study explored the challenges and opportunities of implementing ICT in Uganda's public sector and proposed strategies to overcome these challenges. The findings highlighted obstacles such as limited financial resources, inadequate infrastructure, a lack of ICT skills and training and low ICT awareness among citizens. However, the study also identified avenues for addressing these issues, including public-private partnerships, ICT training initiatives and enhanced citizen engagement through digital platforms. Although the study offered insights from government officials and ICT professionals, it failed to fully explore the experiences of citizens interacting with government services daily. This research aimed to fill this gap by gathering insights from both TVET trainers ,principals and bursars.

In Kenya, Ngugi (2012) study investigated the extent of ICT utilization in managing education in public secondary schools in the Naivasha and Nakuru Counties. Among the study's objectives were an examination of ICT's role in student and staff management. The study's sample consisted of school principals, bursars, secretaries and teachers. Data was analyzed using descriptive statistics. The study highlighted the substantial use of ICT in managing data related to staff and students, as well as in facilitating communication within the school community.

However, it remains essential to examine whether the same level of ICT integration applies to TVETs, which have experienced robust support for ICT facilitation. Although TVETs in Kenya have witnessed increased enrollment due to government support, the extent of ICT's application in administrative functions such as student and staff management remains unclear. This study fulfills this gap.

Similarly, Mue (2014) research investigated the application of information communication technology in school administration within public secondary schools in Lang'ata Division of Nairobi County, Kenya. One of the research objectives relevant to this proposed study concerned the utilization of ICT in human resource management. The research methodology applied involved collecting data through interviews and questionnaires and analyzing the data using descriptive statistics. The study findings indicated that schools in Lang'ata Division had embraced ICT in various administrative aspects, including monitoring attendance, assessing performance, staff training and recruitment.

Conversely, another study conducted by Makewa et al. (2013) in Nandi County reported

limited use of ICT for administrative purposes. This discrepancy could be attributed to the geographical location of the two study areas, where Nairobi County's urban setting potentially enjoys better ICT facilities andtraining compared to the rural Nandi County. Thus, a comparative analysis of ICT utilization between urban and rural settings in TVETs was crucial to understanding this disparity. This study endeavors to reveal the differences in ICT integration between the urban TTIs in Nairobi county and the rural TTIs in Nyeri County.

2.8 Integration of ICT in Instructional Processes

The integration of information and communication technology (ICT) into the instructional processes of technical and vocational education and training (TVET) institutions traces its origins back to the 1980s when computers became more accessible and affordable. During this period, educators began to explore ways in which computers could support teaching and learning activities (Huang et al., 2019). Initially, the primary focus was on computer-assisted instruction (CAI), which entailed using computers to deliver educational content to students (Kabassi, 2016). However, as computers and other ICT tools continued to evolve, TVET institutions expanded their integration of ICT into instructional processes more comprehensively during the 1990s.

This extension involved utilizing computers and ICT tools not only to deliver content but also to facilitate a wide array of instructional activities such as student evaluation, project-oriented learning and collaborative projects (Kozma, 1991). In the early 2000s, the adoption of online learning platforms like learning managementsystems (LMSs) gained prominence in TVET institutions. These systems allowed TVET institutions to offer online courses, manage student registrations, offer online assessments, monitor

student advancement and achievements (Ellis & Phelps, 2016). The emergence of novel technologies, including mobile devices and cloud computing, further revolutionized the use of ICT in TVET instruction. Mobile devices enabled both students and instructors to access educational content and resources from anywhere, while cloud computing facilitated the storage and sharing of instructional materials and real- time collaboration with others (Wang & Li, 2019).

Boholano (2013) contends that the world is undergoing rapid change and simply duplicating existing knowledge and skills is inadequate to tackle future challenges. Schleicher argues that in the past, teachers could anticipate that their teachings would remain relevant throughout their students' lifetimes. However, due to swift technological, economic and social transformations, schools must now prepare students for jobs that have yet to materialize, technologies that have yet to be invented and issues that have yet to surface.

Krüger and Rhiel (2012) highlight that while the content taught in schools is evolving due to continuous innovations and new knowledge shaping the future, the teaching methodologies and instructional technologies employed in schools have sadly remained outdated. This issue is particularly pronounced in rural areas and especially in sub-Saharan Africa, where traditional classroom and textbook- based educational systems are growing increasingly obsolete. Instructional management seeks to enhance teaching and learning by prioritizing methods to instill excellence in instructional quality.

Currently, advancements in ICT, as acknowledged by Roberts and Sikes (2011), demand educators to adopt more efficient and contemporary approaches to instructional

management, equipping students with knowledge and skills that foster creativity and progress. The effective utilization of ICT as teaching and learning resources has been linked to significant improvements in students' academic achievements. Additionally, students gain confidence as they engage with teachers and, at times, collaborate as peers to address technological challenges (Kristiawan & Muhaimin, 2019). Modern technologies have the potential to enhance the acquisition of practical skills, founded on the premise that learning is fundamentally a social phenomenon.

Engida (2011) study underscores the necessity for subject-specific pedagogical emphasis in many TVET preparation programmes, as well as content-specific pedagogy that integrates ICT as a key component. Hooker et al. (2011) advocate for ICT to facilitate virtual learning environments and to foster the development of 21st-century skills among learners. Achieving this requires access to ICT facilities, enabling the effective integration of new tools and methodologies into the curriculum. Murgor's (2015) study suggests that TVET instructors should adopt a broader perspective when considering ICT integration and be reflective in their teaching practices as they use ICT to support and facilitate instruction.

The integration of ICT into curriculum instruction stands as a pivotal rationale for incorporating ICT into all aspects of TVET management(UNESCO, 2015). Moreover, integrating ICT into teaching and learning is central to the core mission of TVET institutions: equipping students with skills that meet the socio-economic demands of the 21st century. A World Bank Report (2017) confirms that computers have enabled teachers toefficiently manage student records, monitor and evaluate performance and utilize the gathered information to inform personalized instruction. The cumbersome

and time- consuming task of record-keeping often diverts attention from more essential responsibilities, hindering teachers from maintaining accurate records. Streamlining this process through computer usage has encouraged teachers to maintain better records and, more importantly, make effective use of the resulting data. ICT can be seamlessly integrated into teaching, learning, management and planning processes.

Numerous studies have explored the extent of ICT integration in curriculum instruction. For instance, a study commissioned by the European Commission examined ICT use in education across 31 European countries (European Commission, 2013). The study, involved over 190,000 respondents; - trainers, students and principals, and arrived at significant findings. Notably, digital resources such as exercise software, online tests, data logging tools and computer simulations were infrequently utilized during lessons (Pradhan et al., 2020). Additionally, the study highlighted a reluctance among teachers to fully transition from traditional methods in classroom instruction to modern methods of ICT enhanced instruction.

Similarly, Altun et al. (2011) conducted a study in Turkey to evaluate ICT integration at the faculty level. They emphasized that successful ICT integration in instructional processes requires addressing administrative requirements related to technical, legal and administrative infrastructure. The researchers underscored the need for collaboration among leaders from various departments, particularly those dealing with technology. The study found that technology departments often play a crucial role in the successful integration of ICT. Challenges encountered during ICT integration included insufficient resources and support from administrators, equipment issues anda lack of motivation.

In a study by Junaidi et al. (2020), ICT usage in teaching English was assessed in Pekanbaru, Indonesia, with a focus on exploring challenges faced by junior high school teachers. The researchers collected data from 131 junior high schools, involving a total of 180 teachers. Findings indicated that implementing ICT in schools posed challenges, mainly due to teachers lacking the necessary skills and background knowledge of ICT. The study also revealed that teachers exhibited resistance to changing their teaching approaches and lacked flexibility.

Highlighting the importance of pre-service teachers acquiring ICT competency for effective integration, Aslan and Zhu (2018) investigated factors influencing ICT integration into teaching practices. They examined perceived ICT competence, competence in ICT integration, attitudes toward ICT, anxiety related to ICT usage, external barriers, ICT-related courses, pedagogical knowledge and prior ICT experience among pre-service teachers. The study found that pedagogical knowledge, ICT-related courses and perceived ICT competence significantly influenced the level of ICT integration. Pre-service teacher-training programs, particularly those focused on pedagogical knowledge and ICT, played a significant role in enhancing ICT use in teaching practices among pre-service teachers.

Prasojo et al. (2018) conducted a study to assess the integration of ICT among student teachers from a public university during their teaching practice in Indonesian high schools. Employing a qualitative approach with a case study design, the study revealed limited incorporation of ICT in teaching practices despite the participants' high competency levels and experience in using technology to enhance academic

performance. The findings underscored the need for meaningful insights to facilitate the effective transition of student teachers into professional educators.

In Kenya, the majority of teachers have received traditional face-to-face pre-service training. With the emergence of ICT, in-service courses have been provided to numerous teachers (NCST, 2014). However, the extent to which these teachers integrate ICT into teaching and learning in TVETs remains largely unexplored. Across various South-east Asian economies, schools are undergoing significant transformations that entail shifts in educational practices at all levels (Afzaal, 2012). These reforms encompass curriculum changes and teaching methods, along with the integration of ICT as a pedagogical tool to support instruction. This pressure to enhance student learning through ICT places principals in the role of introducing technology as a pedagogical element to elevate teaching and learning.

The integration of ICT into Malaysia Higher Education Blueprint in 2015 propelled the country's educational institutions to global recognition. This initiative, focusing on personalized learning experiences and addressing student needs, particularly highlights the role of ICT and innovation (Ganaparthy et al., 2017). Insights from the study underscore the challenges faced by ESL trainers in integrating ICT to promote Higher Order Thinking Skills (HOTs), suggesting the need for addressing these challenges to enhance the learning process.

South African studies have consistently demonstrated poor performance in sciences and mathematics, especially in under-resourced institutions (Reddy et al., 2012, 2016). The government's response has been to employ ICT as a tool to bridge educational

disparities, aiming to improve teaching and learning processes. Building upon this context, Graham et al. (2020) explored how various factors influence mathematics teachers' acceptance of ICT integration. The study found that teachers appreciate technology's contribution when it enhances productivity and social performance, emphasizing the need for pedagogical changes and improved conceptual understanding.

Yuen and Chueng (2018) examined challenges and benefits of integrating ICT into classroom instruction in developing countries. Lack of ICT infrastructure, inadequate teacher training and insufficient policies emerged as barriers to integration. Despite these challenges, ICT usage in classrooms was found to motivate students and improve learning outcomes. In Saudi Arabia, Almajalid (2017) investigated ICT integration's impact on student achievement, particularly in mathematics and science, observing a positive effect on engagement and motivation. These studies collectively highlight the potential of ICT integration in enhancing learning activities.

A review by Khan and Aslam (2019) assessed the impact of ICT integration across various contexts, indicating positive effects on learning outcomes, motivation, engagement and teacher development. However, challenges like infrastructure, training and costs remained. Oyelere et al. (2018) evaluated ICT's effect on the teaching and learning process in higher education, finding improvements in engagement, motivation and learning outcomes.

Cheng (2017) study conducted a meta-analysis of evidence on the effectiveness of ICT integration in education. The authors found that ICT integration had a positive effect on student learning outcomes, including improvements in academic achievement and

critical thinking skills. The study also found that ICT integration enhanced student engagement and motivation and improved teacher effectiveness. However, the authors noted that the effectiveness of ICT integration was influenced by factors such as the quality of instructional design, teacher preparation and student access to technology. The study therefore suggests that the integration of ICT in instructional processes can have a positive impact on student learning outcomes, engagement and motivation. However, there are also significant challenges to ICT integration, including lack of infrastructure, inadequate training for teachers and students and high costs.

Raihan and Shamim (2013) examined TVET expansion and ICT utilization in Bangladesh and South Korea and noted disparities in their approaches. Both countries employed ICT as a complementary tool, though South Korea extensively used e-Learning, while Bangladesh experienced a leapfrog in web-based instruction. Technology's role as an instructional tool faced challenges in South Korea and was still at emerging stage in Bangladesh.

A comparable investigation carried out in Cambodia and Mongolia also underscores the slow progress of integrating ICT in curriculum management, despite the availability of digital resources and external support, particularly from donors (Latchem, 2017). This observation aligns with UNESCO's earlier recognition in 2011 that the utilization of ICT for knowledge generation during instruction remains a challenge in the pursuit of effective digitalization of teaching and learning. It is important to explore how this situation applies in the context of Kenya.

The UNESCO Institute for Statistics (UIS) (2014) to assessed the use of ICT in

education across Latin America and the Caribbean. The UIS aimed to evaluate the readiness and preparedness of countries in the region regarding ICT integration. The survey assessed ICT infrastructure, availability of ICT-assisted instruction in schools and teachers' readiness to incorporate ICT into education. The findings highlighted that the Caribbean countries, especially Anglophone ones, demonstrated higher levels of ICT- assisted instruction and possessed essential ICT infrastructure, including hardware andinternet connectivity, in comparison to most Latin American countries.

However, countries like Cuba and the Dominican Republic exhibited limited progress in integration. Notably, countries with strong ICT policies, such as Uruguay, displayed higher levels of integration. This prompts the need to investigate whether a robust ICT policy corresponds to elevated levels of ICT integration in TVET institutions' teaching and learning activities.

Oyeronke and Fagbohun (2013) conducted a study in Nigeria, focusing on computer and ICT skills among secondary school teachers in Ota, Ogun State. The study evaluated training certification levels, willingness to acquire ICT skills and the extentto which teachers integrate ICT in both instructional and administrative functions. Data collection involved questionnaires and was analyzed through descriptive statistical methods. The study revealed that most teachers had received some form of training and expressed interest in ICT training.

However, the integration of ICT in teaching and learning activities waslimited to basic functions like word processing and Power-Point presentations. Sani (2014) corroborated these findings in a review of ICT integration status in educational

practices within the same country, emphasizing the need to compare this situation with Kenya's context, particularly in TVET institutions aiming to leverage ICT for innovative learning.

In Kenya, the National Council for Science and Technology (NCST) conducted a baseline survey in 2007 to assess ICT capacities and competencies in selected secondary schools. Among the survey's goals relevant to the proposed study was describing the extent of ICT use by students, teachers and administrators. The survey employed both qualitative and quantitative information, using a combination of descriptive and exploratory research designs. The sample comprised 810 respondents from 18 national schools and 81 schools of excellence. The NCST findings indicated that teachers' utilization of ICT for daily or weekly teaching purposes was limited. Although secondary school teachers possessed computer skills, their usage of these skills remained limited.

A study similar in scope to the proposed research, focusing on ICT adoption in managing TVET institutions in Nairobi County, was conducted by Mwangi (2016). One of the study's objectives relevant to the proposed research was to assess the extent of ICT usage in TVET institution management. The study employed simple random sampling to select a sample of TVET institutions, gathering data through interviews, observation checklists and questionnaires. The analysis encompassed both qualitative and quantitative methods, concentrating on administrative aspects like student registration, communication and online marketing. However, this study had a broader focus, delving into ICT integration across administrative functions, management and instruction. Additionally, while Mwangi (2016) study was confined

to TVETs in an urban setting, this study included a comparative description of both urban and rural setups.

2.9 Integration of ICT in Financial management

Financial management encompasses the process of acquiring and effectively utilizing financial resources to achieve organizational goals, incorporating the application of general management principles for implementation. In technical and vocational education and training (TVET) institutions, financial management involves activities such as fundraising, judicious fund utilization, future activity planning, overseeing ongoing implementation and forecasting future developments. These functions are facilitated by financial accounting, cost accounting, budgeting and statistics (Binuyo and Aregbeshola, 2014).

Broadly, ICT is recognized as a dependable means of establishing a robust internal control system for financial reporting. An effective ICT framework ensures the secure and reliable delivery of financial information, encompassing the entire accounting cycle. Accounting software platforms play a role in promoting transparency in financial transactions. Amukhuma (2018) underscored a significant aspect of modern business operations, emphasizing that accounting information systems stand as some of the oldest and mostextensively employed systems in the corporate landscape.

These systems, which have evolved alongside technological advancements, not only capture historical cash flows within organizations but also wield the power to generate pivotal financial forecasts. This capability is rooted in the synergy between traditional accounting practices and computer-based systems, forging a dynamic pathway toward

informed decision- making.

Building upon this perspective, Ngugi (2012) echoed the sentiment regarding the strategic importance of Information and Communication Technologies (ICTs) in the realm of financial management within educational institutions. Specifically, Ngugi focused on the pivotal role of ICTs in storing, analyzing and harnessing data for effective school financial management. This expansive role encompasses diverse areas such as budget allocations, expenditures, students' fee payments and general accounting procedures. By harnessing the capabilities of ICTs, educational institutionscan elevate their financial management practices to an entirely new level, fostering efficiency, accuracy and transparency in financial operations.

In tandem with the broader perspective of financial planning and control, the intricate process of budgeting within Technical and Vocational Education and Training (TVET) institutions emergesas a focal point. This process, vital for effective resource allocation and utilization, demands unfettered access to a multitude of information sources. It is here that the transformative power of ICTs steps in, effectively assuming the role of an enabler. The multifaceted potential of ICTs lies in their capacity to gather, process and disseminate information seamlessly. In the context of budgeting within TVET institutions, this capacity translates into the ability to draw upon a diverse array of data sources.

These sources encompass historical financial data, enrollment figures, resource utilization patterns and various external economic factors. The amalgamation of these data streams equip budgeting processes with a robust foundation, ensuring that

allocation decisions are well-informed, strategic and aligned with the institution's objectives.

The integration and utilization of Information and Communication Technology (ICT) within institutional financial transactions bring forth a multifaceted impact, prominently among which is the invaluable attribute of transparency. This facet stands as a potent deterrent, staunchly guarding against the misallocation of financial resources by administrators. By illuminating the financial landscape with a layer of openness, ICT-driven processes engender a level of accountability that is pivotal for maintaining the integrity of financial operations within organizations. This is notably exemplified in the works of Kapkiai et al. (2017).

In essence, the infusion of ICT into financial transactions acts as a safeguard against potential improprieties or inefficiencies in resource allocation. The utilization of advanced accounting software, data management systems and secure digital platforms empowers administrators to not only track and manage financial inflows and outflows but also to disseminate this information across the organization in a transparent manner. Such openness inherently discourages any unauthorized manipulations or misdirection of funds, as every financial action is accounted for and visible to relevant stakeholders. A paramount outcome of this heightened transparency is the facilitation of proper allocation of financial resources to their intended purposes.

The demarcation of funds for specific initiatives, projects, or departments is distinctly delineated, ensuring that financial resources are channeled to where they are most needed and can have the greatest impact. This strategic alignment, in turn, elevates

operational efficiency and enhances an organization's overall effectiveness.

The recognition of enhanced transparency in financial management as a central tenet of ICT's democratizing role is underscored by the World Bank. In the contemporary era, where ICT's influence permeates nearly every facet of society, its transformative potential is not limited to technological advancements alone. Rather, it extends to the sphere of governance, accountability and equitable resource distribution. As the World Bank acknowledges, the cultivation of transparent financial practices through ICT platforms is a pivotal stride toward promoting fairness, equity and inclusivity.

Technical and Vocational Education and Training (TVET)managers require fundamental information in supply management and procurement for informed budget monitoring and control decisions. Makewa, Role & Nyamboga (2011) noted that ICT integration simplifies school financial information management systems. Similarly, Wagithunu et al. (2014) highlighted ICT's significancein improving school financial information management, facilitating data availability tostakeholders. Furthermore, educational managers rely on basic information aboutstudent and teacher flows and resource allocation to make resource allocation decisions.

ICT management systems, exemplified by customized Management Information Systems (MIS), enhance financial management through tailored tools designed to facilitate financial transactions within schools. The nature of financial management varies across institutions due to local circumstances. In TVET institutions, the financial manager (bursar or Finance Officer) oversees financial policy implementation, processing and budget monitoring. ICT aids in communicating financial information to

the administration for informed decision-making (Wasike et al., 2020). Financial software allows bursars to provide insights into the institution's financial direction and make comparisons across periods.

According to Deya (2016), deploying ICT for accounting necessitates standardized software across interconnected computers to automate transaction logging. Notably, developing a standard payroll computer system could further streamline financial management. A payroll system entails a set of interrelated items and rules governing pay conditions in an organization, including salary structure, tax schedules, benefits and pay dates. In a networked environment, automation of functions by the finance officer facilitates duties. Tanui and Achoka (2014) explored ICT's application in finance administration, revealing that institutions widely adopt accounting software packages for producing reports and managing finances.

Similar packages, such as Sage, prevalent among small to medium UK businesses, streamline operations, including payroll and debt factoring. Papadakis (2016) affirmed the widespread use of spreadsheets by finance departments for managing cash flow. These packages can enhance efficiency and accountability within institutions. Considering the substantial financial support TVETs receive from the government, efficient financial management systems are essential (Picatoste et al., 2018). However, the extent to which they adopt ICT for enhanced financial management remains unclear. Lee and Jim (2017) conducted a study on the integration of ICT in financial management across ASEAN countries and the factors influencing its adoption.

The study employed a comparative case study methodology to assess ICT integration

in financial management in five ASEAN nations. Malaysia and Thailand demonstrated higher levels of integration, influenced by government policies, infrastructure and organizational factors. The researchers concluded that integrating ICT in financial management enhances efficiency. This research aims to address gaps in understanding the factors driving ICT adoption in financial management.

Liu and Hwang (2016) conducted a study aiming to assess the degree of ICT integration in financial management practices within the United States and to investigate the factors that impact the adoption of ICT in financial management. The research employed a survey methodology to gather data from 150 financial managers across diverse industries in the United States. The survey questionnaire encompassed inquiries regarding the extent of ICT integration, benefits and challenges related to ICT integration and the determinants influencing its adoption in financial management. The findings indicated a relatively high level of ICT integration in financial management practices in the United States. Most financial managers employed ICT for accounting, financial analysis and reporting purposes. Noteworthy advantages included enhanced efficiency and accuracy, while primary obstacles revolved around security and data privacy concerns.

Factors influencing ICT adoption encompassed organizational culture, government regulations and financial resources. Although the study concludedthat integrating ICT in financial management practices is essential for efficiency and effectiveness, it did not detail how ICT integration impacted the financial performance of the assessed institutions.

Studies carried out in European countries related to ICT integration in financial management yielded comparable outcomes. For instance, Carmona and Gutierrez (2018) investigated the incorporation of ICT in financial management practices among European SMEs and aimed to identify the factors influencing its adoption. The researchers employed a survey approach to gather data from 441 SMEs situated in various European nations. The survey instrument included questions concerning the extent of ICT integration, benefits and challenges tied to ICT integration and the determinants impacting its adoption in financial management.

The findings revealed a relatively modest level of ICT integration in financial management practices among European SMEs. Most SMEs employed ICT for fundamental accounting functions, with limited use in financial analysis or forecasting. While benefits included improved efficiency and accuracy, key challenges related to cost andcomplexity. Factors affecting ICT adoption encompassed organizational size, technological competence and external pressures from customers and suppliers. The study concluded that SMEs should enhance their adoption of ICT in financial management practices to bolster competitiveness and performance. However, the study centered on SMEs, whereas the present study focuses on TVETs in Kenya.

Yousefi and Saeedi (2018) conducted a study examining the influence of ICT on financial management practices in Canadian universities. The research utilized a quantitative research design and gathered data via a survey involving 150 financial officers from 50 Canadian universities. The findings indicated that ICT had a favorable impact on financial management practices in Canadian universities, particularly concerning efficiency and effectiveness. The study concluded that integrating ICT into

financial management practices in Canadian universities is pivotal for enhancing efficiency and effectiveness.

Makgato and Mafata (2017) explored the effect of ICT integration on financial management in South African public universities. The research aimed to address financial management challenges such as inadequate practices and limited accountability in South African public institutions. Employing a mixed methods approach, the study revealed that ICT integration positively influenced efficiency and transparency in financial management. The integration streamlined financial processes, mitigated errors and fraud and enhanced overall financial management. Consequently, the study recommended increased allocation of resources to support ICT integration, accompanied by comprehensive training and support for administrators and staff. However, the study's limitations included its small sample size and its exclusive focus on South African public schools.

Adeyemo and Popoola (2015) delved into the impact of ICT on financial management practices in Nigerian universities. Utilizing a mixed-methods research design, the study collected data through surveys, interviews and document analysis from 200 financial officers across 20 Nigerian universities. The research unveiled that ICT had a favorable influence on financial management practices, particularly enhancing accuracy and timeliness of financial reports. The study emphasized the necessity of ICT integration in financial management practices to elevate report precision and timeliness.

Majority of scholars concur that ICT integration in developing countries is less pronounced compared to developed nations (Nwagwu, 2006; Dotong et al., 2016; Gries

et al., 2018). To ascertain the contributing factors of the differences, Kamau and Munene (2017) reviewed existing literature concerning the role of ICT in enhancing financial management practices in developing nations. The qualitative research design collected data from academic sources, revealing that while ICT holds the potential to enhance financial management in developing countries, substantial barriers hinder its adoption. These barriers include inadequate infrastructure and limited financial resources. Consequently, the study recommended that the adoption of ICT in financial management practices within developing countries necessitates comprehensive strategies to address these barriers. However, the study did not delve into specific barriers in different contexts or offer strategies to counter them, an aspect this research aimed at exploring.

Lupiana and Mkumbwa (2019) undertook a similar study focusing on Tanzanian public universities. The research aimed to address financial management challenges in these institutions. The findings showcased that integrating ICT into financial management positively affected efficiency and transparency. Accordingly, the study suggested increased resource allocation for ICT integration, coupled with training and support for administrators and staff to effectively employ ICT tools in financial management processes. Nonetheless, the study's limitation lies in its exclusive focus on two Tanzanian public universities, possibly not representing all public universities in Tanzania.

Similarly, in Ethiopia, the surge in financial transaction complexity within educational institutions, alongside the challenges posed by manual financial processes, necessitates prompt ICT financial management system integration to bolster efficiency,

transparency and accountability. This has prompted scholars to delve into the benefits institutions gain from such integration. Tadesse and Tafa (2019) assessed the current status of ICT utilization in financial management among Ethiopian TVETs. The survey-based study gathered data from 94 TVET institutions, revealing that the majority lacked necessary ICT infrastructure and proficient personnel for effective financial management. The study stressed the need for these institutions to invest in both ICT infrastructure and staff training to ensure efficient financial management.

Additionally, Alemu and Molla (2019) conducted a study to explore ICT's impacton financial management within Ethiopian TVETs. The study employed a case study approach and collected data from two TVET institutions that had implemented ICT in their financial management operations. Results illustrated that ICT integration improved financial management, from budget preparation to accounting and financial reporting. The study recommended investing in ICT to elevate financial management practices within TVETs. Thus, the researchers concurred that integrating ICT into financial management in Ethiopian TVETs has the potential to enhance financial practices.

In Ghana, as government funding, donor contributions, NGOs and other stakeholders increasingly support education, the demand for accurate and timely financial reporting is rising (Amedeker, 2020). In addressing this, Gyaase et al., (2013) assessed the utilization of ICT in preparing and submitting financial returns within the Ghana Education Service (GES). They employed purposive sampling, administering questionnaires to GES financial administrators and officials. Results indicated that while respondents acknowledged the tediousness of manual financial transaction

management, the utilization of ICT remained minimal, leading to delays in financial reporting. The study also revealed inadequate ICT facilities and employee unfamiliarity with accounting packages. Notably, similar research on ICT integration in TVETs is scarce.

Muema (2015) study investigated ICT integration in financial management within a specific secondary school in Tanzania. The research addressed questions about the extent of ICT usage in school financial management. The study used purposive sampling to select a school with a history of ICT integration and respondents assumed to possess vital information, including the headteacher and finance manager. Findings revealed that all financial transactions were conducted online using TAF software.

The finance manager confirmed that parents paid fees at the bank and obtained computer- generated receipt books from the finance office. Banks also sent weekly online statements to the school. Additionally, financial books of accounts were computer- generated. Nonetheless, the study's case study nature limits generalization. This study, applies descriptive survey and provides a comprehensive overview of ICT utilization in financial management within TVETs, allowing for broader conclusions.

Additionally, Masenge (2019) study examined the integration of ICT in the management of TVET institutions in Tanzania. This study employed a qualitative research design involving interviews with ten (10) TVET institution administrators. The study found that ICT integration has significantly improved the management of TVET institutions in Tanzania. Specifically, it has enhanced data management, communication and decision-making processes. It was recommended that TVET

institutions in Tanzania should invest more in ICT infrastructure, training and support services to maximize its benefits. Therefore, ICT integration is a critical factor in improving the management of TVET institutions in Tanzania. However, the study did not explore the cost-effectiveness of ICT integration in TVET management in Tanzania.

Oyier et al. (2015) conducted a study that assessed the integration of ICT in the management of private secondary schools in Nairobi County, Kenya. One of the study's objectives was to examine the extent of ICT usage in financial management. The researchers employed a survey design and targeted a population of 140 private schools. They conducted interviews with 40 principals, who were selected through random sampling. Data was analyzed using descriptive statistics. The findings revealed that 25% of schools had automated accounting systems, 71.9% had automated payroll systems and 53.1% utilized ICT for budgeting operations.

The study also highlighted that the use of ICT had significantly enhanced efficiency in financial management. However, it's important to note that this study focused exclusively on private institutions, which may differ from public institutions, particularly in terms of ICT facilitation. This study, on the other hand, targets public TVET institutions primarily funded by the exchequer.

Mwaniki and Njoroge (2018) conducted a similar study focused on Kenyan secondary schools. They evaluated the impact of ICT on financial management practices in these schools. The findings indicated that the adoption of ICT in financial management practices was still limited, with minimal integration into the financial management

processes. The study concluded that there's a need to enhance the adoption of ICT in financial management practices to improve overall efficiency and effectiveness. However, the study did not delve into the specific benefits derived from ICT integration in financial management.

Kombo (2015) conducted a study that examined the extent of ICT integration in the management of public secondary schools in Kinango Subcounty, Kwale County, Kenya. One of the study's objectives was to assess the degree of ICT integration in financial management. The researchers used a purposive sampling technique, selecting ten principals, ten deputy principals and 18 heads of department. Data was collected through interviews and questionnaires and subsequently analyzed. The findings revealed that ICT was not well-integrated into financial management practices. Manual financial transactions were predominant, leading to inefficiencies and subjective financial operations. However, it's important to note that this study was conducted in a rural setting, while the proposed study will encompass TVET institutions in both rural and urban areas.

Kariuki et al. (2017) undertook a study that investigated the role of ICT in enhancing the administration of TVET institutions in Kenya. The study aimed to explore the effectiveness of ICT in improving administrative processes in these institutions. The researchers employed a mixed-method research design involving surveys and interviews. They administered questionnaires to sixty (60) TVET institution administrators and conducted interviews with six ICT experts. The study found that ICT integration significantly enhanced the administration of TVET institutions, particularly in data management, communication and decision-making processes. The

study recommended increased investment in ICT infrastructure, training and support servicesfor TVET institutions to maximize these benefits. Nonetheless, the study did not delveinto the challenges and barriers of ICT integration in TVET administration in Kenya.

Mue (2014) conducted a study to investigate the application of Information and Communication Technology in school administration. One of the objectives was to examine the integration of ICT in financial management. The study employed a survey research design with a target population of 430 individuals, including students, computer teachers and school administrators. The researchers used both simple random sampling and purposive sampling procedures to arrive at the sample. The findings indicated that ICT was inadequately utilized in financial management, with manual processes being predominant, even in functions such as the preparation of financial statements. The study also noted that ICT integration was largely limited to clerical functions. However, it's important to mention that this study was conducted in an urban setting. A comparative study is needed to assess institutions in both rural and urban setting.

2.10 Integration of ICT in Assessment Practices

The integration of information and communication technology (ICT) in assessment practices has been a gradual process that has evolved over several decades (Wang & Li, 2019). In the early years, assessment was typically conducted using paper-and-pencil tests, which had limitations such as limited feedback, time-consuming scoring and restricted accessibility. However, with the advent of computers and the internet, the landscape of assessment has changed significantly (Kozak & Kaygisiz, 2017).

The dynamic landscape of educational assessment experienced a significant metamorphosis in the 1980s with the emergence of a groundbreaking approach known as computer-based testing (CBT). This innovative paradigm shift marked a transformative departure from the conventional paper-and-pencil assessment methods, ushering in a new era of technological integration that would profoundly impact the educational sphere. The catalyst for this transformation was the development of standardized tests that would come to be recognized as quintessential in the evaluation of academic potential and readiness.

Among these pioneers were the illustrious Graduate Record Examinations (GRE) and the Scholastic Aptitude Test (SAT), emblematic of a new wave of assessment tools that harnessed the power of computers and digital platforms (Wang & Li, 2019). These tests were not just vehicles for gaugingacademic proficiency; they represented a pivotal leap forward in terms of efficiency, reliability and security in assessment. The efficiency experienced a seismic shift as CBT rendered the process of test administration and scoring notably streamlined. The arduous logistics of distributing, collecting and manually grading voluminous stacks of paper were supplanted by the seamless orchestration of digital interfaces. This not only accelerated the assessment process but also eliminated the potential for human errors and biases inherent in manual grading.

Moreover, the reliability of assessment outcomes received a substantial boost. CBT, guided by the precision of algorithms and automated scoring mechanisms, ensured uniformity and consistency in the evaluation of test-takers. The elimination of subjective grading, characteristic of traditional paper-based tests, meant that every

participant was subject to the same objective criteria, thus enhancing the integrity of the assessment process.

Security, a cornerstone of any assessment system, underwent a paradigm shift with the advent of CBT. Digital encryption, biometric identification and sophisticated anti-cheating measures fortified the sanctity of the assessment environment. Gone were the days of concerns over paper leaks, impersonation, or manipulation of answer sheets; CBT introduced a level of security that was both robust and reassuring.

As the ripples of this technological wave reverberated, the domain of CBT expanded its influence beyond the realms of standardized testing. The same principles that had revolutionized major assessment tools like GRE and SAT began permeating diverse fields, including vocational education and training (VET). The pioneering research by Finger and König (2019) bore testimony to the widening scope of CBT, demonstrating its efficacy in evaluating vocational competencies, technical skills and hands-on proficiencies.

The 1990s saw the emergence of the internet and the proliferation of e-learning, which paved the way for web-based assessment (Hughes & Lyons, 2017). Web-based assessment allowed for more flexible, interactive and multimedia-rich assessment practices. It also enabled the use of online collaborative tools, such as wikis and forums, to support formative assessment and feedback (Manninen & Suhonen, 2019).

In the early 2000s, the focus shifted towards the integration of ICT in authentic assessment practices, which aimed to measure students' performance in real-life

situations (Kirtley & Hudson, 2011). Authentic assessment enabled the integration of simulation and game-based learning, which provided students with opportunities to engage in problem-solving and decision-making activities that mimicked real-world scenarios. This approach to assessment is particularly relevant to vocational education and training, where the focus is on developing practical skills that can be applied in the workplace (Harteis & Goller, 2014).

In recent years, the integration of ICT in assessment practices has continued to evolve with the emergence of adaptive testing and learning analytics (Qin et al., 2021). Adaptive testing involves the use of computer algorithms to adapt the difficulty level of the test to the individual student's abilities. Learning analytics, on the other hand, involves the use of data analytics to gather insights into students' learning behaviors and performance with the aim of improving teaching and assessment practices.

To incorporate ICT into the teaching and assessment methods used by pre-service teachers, the study by Aslan and Zhu (2018) indicated that these teachers must develop their information and communications technology (ICT) expertise. The objective of the study was to determine the extent to which ICT-related factors, such as perceived ICT competence, perceived competence in ICT integration, attitudes toward ICT, anxiety regarding ICT usage, external barriers to ICT integration, ICT-related courses, pedagogical knowledge and prior experience regarding the use of ICT, influence the integration of ICT into teaching practices for pre-service teachers.

The findings from the data collected from questionnaires administered to the selected 599 pre-service teachers in their fourth year of training programs revealed that

perceived ICT competence, ICT-related courses and pedagogical expertise all strongly influenced the incorporation of ICT into teaching practice. 17% of the integration of ICT into educational methods was predicted and accounted for by these three variables.

The study results also demonstrated that pre-service teacher training programs, particularly pedagogical knowledge and ICT-related courses, have a substantial influence on pre-service teachers' ability to employ ICT in their instructional practices. Assessment is essential because it enables teachers to monitor students' learning growth and create plans that will help them meet their learning objectives (Monteiro et al., 2021). In schools, formative assessment is regarded as a tool that helps teachers assess how well their lessons are presented.

A study by Salam (2018) noted that the integration of formative assessment into elementary school lessons is crucial for the growth of ICTproficiency. An evaluation of the finished ICT output, like the writing sample, will onlygive the teacher partial and frequently very restricted proof of a child's ICT capability. The finished result is the outcome of a much more drawn-out and difficult process andit is the process itself that will give you the opportunity for evaluation.

A study by Blau and Shamir-Inbal (2017) assessed the systemic changes in the national ICT programme among elementary schools in Israel. The target population consisted of school principals, ICT facilitators and 392 students who were in their third and fourth years of the ICT program. An online questionnaire was used to obtain data from the respondents. The study findings revealed that teachers have adopted the use of ICT in lessons to enhance pedagogy, improve their digital competence, update the class

website, update the school portal and engage in e-communication within school staff and with students and parents. The study also revealed that the overall school ICT culture and the majority of its elements have continued to undergo significant changes between the third and fourth years of ICT integration.

Several studies provide solid evidence that changes made to improve the continuous feedback students receive about their learning result in significant academic achievement. A study by Hopfenbeck (2018) indicated that along with an examination of the techniques employed by teachers and the formative strategies integrated in systematic approaches such as mastery learning, student views and their role in self-assessment should be taken into account. The nature of feedback will then be more thoroughly and theoretically analyzed and this serves as a foundation for a discussion of the creation of theoretical frameworks for formative assessment and the potential for practice improvement.

Furthermore, Eden and Eshet-Alkalai (2013) study explored the impact of technology integration in TVET. The authors found that the use of technology in vocational education can improve student motivation and engagement. They also found that technology integration can enhance the quality of instruction and provide more opportunities for authentic learning. Their findings agree with Parsons (2002) study on ICT in vocational education and training with reference to virtual classrooms. Findings indicated that the use of virtual classrooms can provide flexible and accessible learning opportunities for students.

They also found that virtual classrooms can promote collaborative learning and increase

student engagement. However, the two findings failed to provide detailed insights regarding how the integration enhanced efficiency in assessment practices. Additionally, the studies reviewed above focus on the general impact of technology on vocational education and training. This study bridges the gap by investigating the impact of technology on the assessment of specific vocational skills, such as automotive repair, plumbing and welding.

Chen (2017) study sought to investigate language teachers' perceptions and practices of integrating ICT in assessment practices in the United States. The study employed a mixed-methods design and collected data from 51 language teachers from two universities in the United States. Data were collected using questionnaire and interviews.Data was analyzed using descriptive statistics and content analysis. Results indicated that although most language teachers had positive attitudes towards integrating ICT in assessment practices, they faced various challenges such as lack of training and technical support, limited access to technology and concerns about test security and reliability.

It was therefore concluded that although integrating ICT into assessment practices has potential benefits, it requires careful planning and support to overcome the challenges and ensure its effectiveness. Similarly, language teachers should be provided with training and technical support to enhance their confidence andcompetence in integrating ICT into assessment practices. However,the study was limited to language teachers at two universities in the United States, which limited the generalizability of its findings.

Tan and Ang (2017) study investigated the impact of ICT integration on assessment

practices in Malaysian schools. The study used a mixed-methods approach consisting of surveys, interviews and document analysis. A total of 172 teachers and 17 school administrators from six schools in Malaysia participated in the study. The collected data was analyzed using descriptive statistics and thematic analysis. The study found that the integration of ICT in assessment practices had a positive impact on teaching and learning in Malaysian schools. Teachers reported that ICT tools helped them create more engaging and interactive assessments and enabled them to provide more timely feedback to students.

On the other hand, students noted that they found ICT-assisted assessments to be more engaging and enjoyable than traditional paper-based assessments. Therefore, ICT integration in assessment practices has the potential to improve the quality of education in Malaysia. However, the authors also noted that there are still some challenges that need to be addressed, such as the need for more training and support for teachers and the need for more research on the effectiveness of ICT-assisted assessments. There is also a need to allocate resources to support the integration of ICT in assessment practices in Malaysian schools and more research should be conducted to explore the effectiveness of different ICT tools and platforms.

Another study by Yates and Johnston (2018) discussed in detail the issues around policy, practice and implementation of formative assessment practices. The study outlined that any theory of formative assessment must be embedded within a wider theoretical field, specifically within a theory of pedagogy. This is because educational design and assessment are associated with theories of pedagogy, instruction and learning while also taking specific subjects into account. However, Andersson and Palm

(2018) argued that there isn't enough solid research on formative assessment to guide teachers in putting it into practice. In addition, there is also a lack of research on professional development initiatives in formative assessment and their effects on teacher effectiveness and student productivity.

Additionally, Akter et al. (2018) study explored the perceptions of secondary school teachers regarding the integration of ICT in classroom assessment in Bangladesh using a qualitative approach. It was established that most of the teachers perceived the integration of ICT in classroom assessment as beneficial. They reported that ICT tools helped them create more engaging and interactive assessments and enabled them to provide more timely feedback to students. However, the teachers also reported that there were some challenges associated with the integration of ICT in classroom assessment, such as the lack of training and support for using ICT tools and the limited availability of ICT resources.

The study supports that conducted by Tang and Ang (2017) on Malaysian schools. Clearly, the integration of ICT in classroom assessment has the potential to improve the quality of education in Bangladesh. The study, however, did not highlight the effectiveness of different ICT tools and platforms in classroom assessment. The gradual change in evaluation practices in learning institutions, especially in Europe,is notable. Relatedly, Redecker and Johannessen (2013) study investigated the changes associated with institutions shifting from traditional assessment practices to current digital assessment practices.

Accordingly, the past years have been characterized by e-assessment focusing on

enhancing the efficiency and effectiveness of test administration and improving their reliability and validity in terms of test scores.

However, most institutions have grounded their online assessment strategies on the traditional assessment paradigm, which has for a long time dominated the formal education sector's assessment practices. Nevertheless, as society is rapidly changing its skills requirements, there is a need for assessment practices to focus more on holistic key competencies and general skills that are helpful in the 21st century in that they provide opportunities for assessment practices that encompass capturing complex skills and competencies that are challenging to assess. The urgent need therefore compels institutions to develop assessment pedagogies that reflect the crucial competencies needed in the 21st century.

On the other hand, Hartmeyer et al. (2018) study outlined that some of the barriers to the implementation of formative assessment practices include teachers who experience difficulty with students' diverse learning styles, interruptions from students and time constraints. The results from the interview conducted with 22 teachers in Sweden also revealed that most teachers suggested the need for more guidance and information on how to carry on with the assessment practice, the chance to collaborate with others through networks and expanded use of the new strategy with more coworkers. Therefore, the study recommended the implementation of training programs to train teachers on how to effectively carry out assessment practices with their students.

Kihoza et al. (2016) case study investigated the opportunities and challenges in classroom ICT integration in relation to Technological Pedagogical and Content

Knowledge (TPACK) and SAMR (Substitute, Augmentation, Modification and Redefinition) models. The study targeted tutors and teacher trainees from teacher training colleges in Tanzania. The major finding of the study was that most of the respondents had low pedagogical ICT competencies.

However, when using the TPACKand SAMR constructs, the study showed that tutors exhibited good knowledge levels in both constructs, whereas teacher trainees had poor skills and inefficient support on the use of basic ICTs, that is, hardware, software and other peripherals. Some of the challenges in ICT integration in the selected teacher training colleges included a lack of infrastructure, a readiness to change and a lack of competencies in pedagogical ICT applications. Thus, the study recommended that the government consider implementing a harmonized ICT in education integration framework that considers the existing opportunities and challenges facing Tanzania's teacher training systems.

Ngowi (2017) case study focused on ICT-supported assessment in a Tanzanian primary school. The study used a qualitative approach consisting of semi-structured interviews with teachers and students, classroom observations and document analysis. It was discovered that ICT-supported assessment had a positive impact on teaching and learning in the primary school. The teachers reported that the use of ICT tools such as tablets and digital assessment software helped them create more engaging and interactive assessments and enabled them to provide more timely feedback to students.

The students also reported that they found the ICT-supported assessments to be more enjoyable and motivating than traditional paper-based assessments. It was therefore

concluded that the use of ICT-supported assessment has the potential to improve the quality of education in Tanzanian primary schools. Like other studies, the authors proposed training and support for teachers and additional resources to be allocated to support the integration of ICT in education in Tanzania.

Mosebo and Makhetha-Kopane's (2018) study also analyzed teachers' perceptions of the integration of ICT in classroom assessment in Lesotho. The study used a qualitative approach consisting of semi-structured interviews with 10 secondary school teachers from urban and rural areas in Lesotho. Findings concurred with other studies that revealed that most of the teachers perceived the integration of ICT in classroom assessment as beneficial. They reported that ICT tools helped them create more engaging and interactive assessments and enabled them to provide more timely feedback to students.

Based on the above results, the researchers concluded that the integration of ICT in classroom assessment has the potential to improve the quality of education in Lesotho. It was also recommended that more resources be allocated to support the integration of ICT in education in Lesotho and that more training and support be provided to teachers to help them effectively use ICT tools in their assessments. The study focused on primary rural schools, which might have different results when TVETs in Nairobi and Nyeri are assessed.

ICT integration in assessment practices has been an area of growing interest in Kenya due to its potential to enhance the quality and effectiveness of education. One scholar, Koech (2016), investigated the integration of ICT in assessment practices in public

secondary schools in Kenya. A descriptive survey research design was used and data were collected through a questionnaire from a sample of 200 teachers in public secondary schools. According to the results, ICT was not fully integrated into assessment practices in public secondary schools in Kenya due to barriers such as a lack of ICT infrastructure, inadequate training and a lack of funds. The study therefore recommended that the Kenyan government provide more funding for ICT infrastructure and training to enhance ICT integration in assessment practices.

Additionally, a study by Muthaa (2019) sought to find out teachers' attitudes towards the integration of ICT in assessment practices in Kenya. The researcher utilized a mixed-methods research design and collected data using a questionnaire and focus group discussions with 200 teachers. The study found that teachers had positive attitudes towards the integration of ICT in assessment practices. Additionally, the main factors influencing teachers' attitudes were their ICT skills, their perceptions of the usefulness of ICT and the availability of ICT infrastructure. Therefore, teachers' ICT skills should be improved and more ICT infrastructure should be provided to enhance the integration of ICT in assessment practices. However, the study failed to outline how and which ICT infrastructure was essential in enhancing their attitude towards ICT integration in assessment practices.

A study by Murithi and Yoo (2021) investigated assessment conceptions and practices among primary school teachers and students in Kenya. The study noted that the way in which teachers and students perceive assessment affects how assessments are used in the classroom and how students learn. The study employed a multiple-case research design so as to examine the student's and teacher's conceptions of assessment practices

and to compare the teachers' assessment practices with student learning. The target population consisted of 87 respondents, that is, 5 teachers and 82 students. The researcher conducted individual interviews with the teachers and engaged the students in focus group discussions.

The findings of the content analysis obtained from classroom observations and the math exam test produced by students revealed that teachers primarily view assessment as a tool for improving instruction, whereas students' conceptions of assessment are more concerned with student and school accountability. The findings led the study to conclude that students' perceptions of assessment are formed through their experiences being assessed in class. The study also recommends that teachers develop assessment paradigms that are in contrast with their practices that enable them to operate within social and contextual restrictions.

Nyaga and Ndirangu (2020) study also evaluated the impact of ICT integration on assessment practices in Kenyan secondary schools using a mixed-methods approach. The study findings revealed that the integration of ICT in assessment practices had a positive impact on teaching and learning in Kenyan secondary schools. Teachers reported that ICT tools helped them create more engaging and interactive assessments and enabled them to provide more timely feedback to students. Also, students noted that they found ICT-assisted assessments to be more engaging and enjoyable than traditional paper-based assessments. Based on their findings, the researchers concluded that the integration of ICT in assessment practices has the potential to improve the quality of education in Kenyan secondary schools. As a result, more resources should be allocated to support the integration of ICT in assessment practices in Kenyan

secondary schools. The study, however, utilized content analysis, which does not allow generalizability.

Alemu and Seid (2020) conducted a case study to determine the integration of ICT in assessment practices in a secondary school in Ethiopia. It was established that the integration of ICT in assessment practices had a positive impact on teaching and learning in secondary schools. According to the teachers, the use of ICT tools such as digital assessment software and interactive whiteboards helped them create more engaging and interactive assessments and enabled them to provide more timely feedback to students.

On the other hand, students noted that they found the ICT- supported assessments to be more enjoyable and motivating than traditional paper- based assessments. The authors therefore concluded that the integration of ICT in assessment practices has the potential to improve the quality of education in Ethiopiansecondary schools. They recommended that more resources be allocated to support theintegration of ICT in education in Ethiopia and that more training and support be provided to teachers to help them effectively use ICT tools in their assessments.

2.11 Summary of Literature and Research Gaps

A case study conducted by Pavlova in 2018 examined how the computerization of school administration affected the responsibilities of principals in Hougang, North Zone of Singapore. The study found that ICT played a pivotal role in simplifying the administrative processes, particularly in the domain of human resource management. This was achieved by facilitating instant communication of available information to

staff members as soon as they logged into the system, enabling them to promptly read, understand and take necessary actions.

However, it's important to note that the study's findings were confined to just one aspect of administrative functions, specifically focusing on human resource management. In light of this limitation, the current study aims to broaden the scope by investigating various elements of administrative functions, including but not limited to Enterprise Resource Processing (ERP) systems and Information Security Management Systems (ISMS). This expanded research seeks to provide a comprehensive Summary of Literature and address potential Research Gaps in the field of computerized school administration.

Chidobi's 2015 research aimed to investigate the utilization of Information and Communication Technology (ICT) in the management of administrative personnel and student records within the public universities located in Enugu State. It's important to note that the research did not delve into the extent of ICT integration within various administrative functions. The study primarily focused on public universities and employed questionnaires as the sole data collection method. To enhance the data collection process, this study will complement the use of questionnaires with interviews, targeting smaller groups of principals and bursars. The study's findings unveiled a deficiency in the effective application of ICT for handling both administrative personnel and student records in Nigerian universities. Furthermore, it is worth mentioning that this study was restricted to collecting data from Technical Training Institutions (TTIs) located in Nyeri and Nairobi counties.

Afzaal (2012) study centered on the utilization of Information and Communication Technology (ICT) within the management of primary schools in Brunei. Notably, the study lacked specific details regarding the instructional methods through which primary school management had incorporated ICT. Moreover, the research primarily concentrated on primary schools rather than Technical Training Institutions (TTIs). In a significant departure from this focus, the study explored into the precise instructional techniques through which TTIs had integrated ICT.

These encompassed a range of digital components, including e-learning systems, e-library resources, e-journals and e-books. Importantly, the study's findings indicated that despite the presence of sufficient ICT infrastructure, the integration of ICT into the processes of teaching and learning remained at a nascent stage. This reveals a notable research gap and underscores the need for further exploration of ICT integration within educational settings, particularly in TVETS.

Raiham and Shamim (2013) study aimed to examine the expansion of Technical and Vocational Education and Training (TVET) in the context of technological advancements, particularly by assessing the utilization of Information and Communication Technologies (ICTs) in the teaching and learning processes within TVET institutions in Bangladesh and South Korea. The study's findings highlighted a significant disparity in the adoption of ICTs; Bangladesh demonstrated rapid progress in web-based and online instruction within the TVET system, whereas South Korean TVET institutions extensively employed e-Learning techniques. This research was characterized by a geographical contrast as it compared TVET organizations between two distinct countries. Similarly, the present study conducts a comparative analysis of

Technical Training Institutions (TTIs) in two Kenyan counties. This comparison in a Kenyan context seeks to contribute to the existing body of literature while addressing potential research gaps in the integration of technology within educational institutions.

Muema (2015) research aimed to evaluate the incorporation of Information and Communication Technology (ICT) within the financial management processes of a specific secondary school. The study revealed that parents made fee payments at the bank and submitted deposit slips to the finance office, where computer-generated receipt books were issued. Additionally, the study noted that banks provided the school with online statements of accounts on a weekly basis. It's important to note that Muema's study took the form of a case study, which inherently limits the extent to which its findings can be generalized to broader contexts.

In contrast, this research seeks to employ a descriptive survey methodology to describe the current status of ICT utilization in financial management within Technical Training Institutions (TTIs). This approach is intended to enable more comprehensive generalizations regarding the integration of ICT in the financial management processes of such institutions, thereby addressing potential research gaps in the field.

Oyier et al. (2015) study focused on the assessment of Information and Communication Technology (ICT) integration within the administrative processes of private secondary schools situated in Nairobi County. The study's results revealed that 25% of these schools had implemented automated accounting systems, 71.9% had automated payroll systems in place and 53.1% utilized ICT for their budgeting operations. Notably, the study presented a contextual gap as it concentrated on ICT integration within the

specific context of private secondary schools. In contrast, the current research endeavors to address this gap by shifting the focus towards public Teacher Training Institutions (TTIs) which predominantly rely on exchequer funding. Through this shift, the study aims to offer insights into ICT integration within a different educational setting, thus contributing to the existing body of knowledge while addressing potential research gaps.

Blau and Shamir-Inbal (2017) study was conducted to identify the systemic changes within the National ICT program as applied in elementary schools in Israel. The study's findings indicated that teachers had embraced the use of ICT in their lessons to enhance pedagogical approaches, improve their digital skills, update class websites, maintain school portals and facilitate e-communication within the school's staff and between students, parents and teachers. However, it's important to note that the study did not delve into the extent of ICT integration in assessment practices.

Moreover, the research was limited in its scope as it specifically examined elementary schools rather than Teacher Training Institutions (TTIs). In contrast, the current study aims to assess the level of ICT integration in assessment practices, including the use of online exam modules and assignment tests, within TTIs located in Nyeri and Nairobi County. This research seeks to address potential research gaps and provide insights into the application of ICT in technical training.

The research conducted by Murithi and Yoo (2021) had the objective of examining the conceptions and practices of assessment within the context of primary school teachers and students in Kenya. The findings disclosed that teachers predominantly perceive

assessment as a means to enhance instruction, while students' perspectives on assessment revolve more around student and school accountability. However, the study did not explore the extent of ICT integration within assessment practices. Additionally, the research was focused on primary schools, rather than Technical Training Institutions (TTIs). To gain a more comprehensive understanding of ICT integration levels, the current study also endeavors comparative analysis specifically within TTIs situated in Nyeri and Nairobi Counties. This approach seeks to address potential research gaps and provide insights into the application of ICT in technical training.

2.12 Chapter Summary

Existing literature suggests that numerous countries have formulated specific policies to revitalize Technical and Vocational Education and Training (TVET) systems in alignment with global commitments and local socio-economic strategies. However, there is a lack of specific policies addressing the integration of ICT in TVET. Instead, ICT integration within TVET often falls under broader education sector policies, as observed in the cases of Britain, America, Nigeria and Kenya. Countries such as Germany, South Korea and Singapore, which possess specific ICT policies for TVET, have made significant strides in both ICT integration and the achievement of TVET objectives.

Further, many countries have strived to equip TVET institutions with digital tools. Notably, South Korea, Singapore, Germany and Malaysia have well-equipped TVETs. In contrast, developing nations like Bangladesh and the Philippines face challenges related to inadequate ICT infrastructure, a senior mirror in Nigeria, Zambia and Malawi. Issues such as limited access to electricity, reliable internet and maintenance pose

barriers to effective use of ICT tools in these contexts.

Furthermore, both local and international literature on ICT integration have predominantly focused on secondary education, likely due to early efforts to digitize education being directed at this level. Initiatives like the Education for All (EFA) and Millennium Development Goals (MDGs) initially emphasized literacy, particularly in primary and secondary education. Consequently, ICT integration in educational management leaned towards these levels. The push to integrate ICT into TVET management gained momentum following the Shanghai Consensus Conference on TVET revitalization, along with alignment to the Education 2030 Agenda and Sustainable Development Goals (SDGs). Consequently, there has been a concerted effort to equip TVET institutions with ICT tools to impart 21st-century skills to learners.

In the context of Kenya, few studies have specifically examined the integration of ICT in TVET institutions at the county level, particularly in making comparisons between counties. While literature exists on ICT integration in the management of learning institutions in Kenya, the focus is primarily on secondary schools, with ICT predominantly used for administrative functions and limited application in financial and instructional management. There is a distinct lack of literature addressing ICT integration in TVETs. Despite considerable governmental investment in ICT, comprehensive assessment of the extent of ICT integration in TVET management is noticeably lacking.

Kenya's commitment to UNESCO's resolutions in 2012 and 2015 to revitalize TVET

and its recognition of TVET's role in equipping learners with skills for industrial growth by 2030 and achievement of the "big four" Agenda, have prompted efforts to provide TVETs with ICT resources. However, the drive to digitalize TVETs and enhance managerial efficiency lacks comprehensive scholarly scrutiny, particularly concerning the current status of ICT infrastructure and the extent of digitalization to meet intended goals. This study aimed at addressing these gaps in the literature.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents an outline of the methodology employed in the study. It covers the research design, target population, sample size and sampling procedures. The research instruments' validity and reliability, data analysis, as well as ethical and logistical considerations, are also delineated.

3.2 Research Philosophy

Research philosophy can be defined as an opinion or belief about how information concerning a phenomenon should be acquired, analyzed and applied (Cazeaux, 2017). Common philosophical terms in research methods are epistemology, referring to "what is known to be true," and doxology, relating to "what is believed to be true." The objective of research involves transforming beliefs into knowledge, moving from doxa to episteme (O'Gorman & MacIntosh, 2016). According to Bauer (2017), research philosophies include positivism, realism, interpretivism and pragmatism. In positivism, reality is deemed stable, perceivable and characterizable.

Positivists also hold that observations should be repetitive; this often involves manipulating reality by altering a single independent variable to identify patterns and connections within the social environment's components. Predictions can then be made based on observed realities and their interactions (Žukauskas et al., 2018). Cazeaux (2017) further notes that positivist studies involve collecting and objectively

interpreting data, emphasizing researcher objectivity and detachment from personal values. The results are often evident and quantitative. Realism deals with concrete realities, observable and measurable through scientific means.

Interpretivism philosophy, on the other hand, asserts that reality is best understood through personal interpretation and interaction with actual facts. Interpretivists stress studying phenomena within their natural context and acknowledge that researchers inevitably influence their subjects (Tamminen & Poucher, 2020). They recognize multiple interpretations of reality, asserting that different perspectives contribute to the scientific knowledge they pursue (O'Gorman & MacIntosh, 2016). While the history of interpretivism isn't as extensive as that of positivism, this study adopts the positivism philosophy.

Pragmatism emphasizes practical application in solving societal problems and therefore this study adopted a dual approach, encompassing both positivism and pragmatism, with the goal of proposing solutions for the integration of ICT into the management of Technical Training Institutes (TTIs) in Kenya. The quantitative method used in this research focuses on objective measurements using numerical data. This includes statistical, mathematical and numerical analysis.

Additionally, in alignment with positivist principles, this study employs a mixed-method research paradigm, incorporating both qualitative and quantitative data. Positivism relies on quantifiable observations that form the basis for statistical analysis. In essence, this research quantifies responses from lecturers and conducts statistical analyses to arrive at objective conclusions.

In positivism studies, the researcher is independent from the study and there are no provisions for human interests within the study. This research aimed at independently explaining the integration of ICT in TVETs and is quite in line with positivists research expectation. Positivists employ inductive reasoning to develop statements (hypothesis) to be tested during the research process. This study also applied inductive reasoning to generate the four hypothesis which were tested.

3.3 Research Design

The research design is a blueprint or a detailed plan for how a research study will be conducted (Akhtar, 2016). The research design for this study was descriptive survey.It is a strategy used to look into a phenomenon and aims to provide answers to several questions (Dannels, 2018). According to Sileyew (2019), the findings obtained from this survey study help researchers understand social phenomena with assurance and authenticity since it uses primary research methodologies.

Further, the descriptive research design addresses the questions that relate to the when, who, what and how of the specific research objectives. As a result, it makes an effort to gather definite data that can be quantified and statistically analyzed for a given subject or audience (Nassaji,2015). Descriptive research can be categorized as either qualitative or quantitative. Therefore, the research design chosen was adequate because it helped the researcher attain the objectives of the study.

The descriptive survey also employed a mixed-methods research approach. The mixed research approach is an approach to study that results in both quantitative and

qualitative data (Creswell & Creswell, 2017). The approach was appropriate for this study because it enabled the researcher to collect quantitative data using the questionnaires that were administered to the trainers and qualitative data obtained from the interview with the bursars and principals separately.

3.4 Location of the Study

The study was conducted within Technical and Vocational Education and Training (TVET) institutions situated in Nyeri and Nairobi Counties. These specific counties were selected for specific reasons. Nairobi County's TVET institutions were chosen because they are the most representative urban TVET institutions. This is mainly attributed to the county's substantial contribution to the Gross Domestic Product (GDP), which accounts for 60% (KNBS, 2021).

Additionally, Nairobi holds the status of being Kenya's capital city, with a diverse urban population of approximately four million residents. It serves as the nation's economic hub, hosting nearly 90% of all industrial ventures in Kenya. The city has a substantial population, with a significant portion residing in informal settlements. Employment opportunities primarily arise from private enterprises and the informal sector, known as the "jua kali," which caters to residents from diverse geographical, cultural, political and socio-economic backgrounds.

On the other hand, Nyeri County symbolizes rural TTIs as it is predominantly sustained by agricultural pursuits. The main economic activities in Nyeri County revolve around coffee and tea farming, as well as small-scale food crop production and livestock raising. Nyeri is largely rural and has a predominantly homogeneous agricultural

economy. It's situated roughly 150 kilometers from Nairobi, on the eastern slopes of Mt. Kenya. The county exhibits dense population and boasts infrastructure development that surpasses the national average in terms of road networks, piped water supply, electricity access and provision of healthcare facilities, compared to other regions of the country.

3.5 Target Population

The target population refers to the total number of individual units, persons, events, cases or other sampling items which are of interest in scientific research (Mohlokoane, 2004). In this study, the target population for this study comprised all principals, trainers and bursars in TVET institutions in Nyeri and Nairobi counties. There are six TVET institutions in Nairobi with 6 bursars and 693 trainers. Nyeri has four (4) TVET institutions with 313 trainers and four (4) bursars (MoEST, 2018). Consequently, the total target population consisted of 10 principals, 1006 trainers and 10 bursars. Table 3.1 provides a summary of the target population.

Table 3.1: Distribution of the Target Population

County	TVET Institution	Principals	Trainers	Bursars
Nairobi	Kabete NP	1	254	1
	Karen TTI (special)	1	20	1
	Kasarani TTI	1	15	1
	Kenya TTI	1	150	1
	Nairobi TTI	1	160	1
	P.C Kinyanjui TTI	1	94	1
Nyeri	Nyeri NP	1	182	1
	Mukurweini TTI	1	35	1
	Mathenge TTI	1	92	1

	Mathira TTI	1	4	1
Total	**10 Institutions**	**10**	**1006**	**10**

Source: Ministry of Education Nyeri and Nairobi Counties (2018)

3.6 Sample Size and Sampling Procedures

The sample for this study was drawn from the target population. A purposive sampling approach was employed to select 10 bursars and 10 principals from the 10 TVET institutions located in Nyeri and Nairobi counties. The use of purposive sampling was justified due to the specific nature of the bursars and principals in these institutions, with one representative chosen from each institution. The principals and bursars were considered ideal participants for this study since they are actively involved in the acquisition, utilization and maintenance of technical equipment.

Additionally, they play a significant role in administrative functions and financial management practices that necessitate online approvals. Consequently, they were well-suited to provide insights into ICT integration within the TVET institutions, including aspects like budget allocations, procurement procedures and the current status of ICT integration within these institutions.

Singh and Masuku (2014) assert that stratified random sampling is a method for data collection if the population is heterogeneous. In this approach, the population is divided into a number of homogeneous groups known as strata. A sample is then drawn at random from each stratum according to its proportion in the population. In this study, the sampling frame was first stratified according to the TVET institutions; each TVET institution formed a stratum, thus creating a total of 10 strata. After stratification of the sampling frame, proportionate sampling was applied. In this study, sampling tables by

Krejcie and Morgan (1970) were used to determine the sample size of the trainers. A population of 1006 trainers was adequately represented by a sample of 290 trainers, which was proportionately sampled. The total sample in the study consisted of 10 principals, 290 trainers and 10 bursars, whose aggregate was 310 respondents. Table 3.2 presents a summary of the sample size distribution.

Table 3.2: Sample Size Distribution

Institution	Principals	Trainers	Bursars
Kabete NP	1	73	1
Karen TTI	1	6	1
Kasarani TTI	1	4	1
Kenya TTI	1	43	1
Nairobi TTI	1	46	1
PC Kinyanjui TTI	1	27	1
Nyeri NP	1	53	1
Mukurweini TTI	1	10	1
Mathenge TTI	1	27	1
Mathira TTI	1	1	1
Total	**10**	**290**	**10**

Simple random sampling was applied within the TVETs to arrive at individual trainers who took part in the study. To achieve this, the trainers were first stratified according to their sections and strength in numbers. The trainers were then drawn at random from each stratum (section) according to their proportion in the population.

3.7 Research Instruments

The study adopted the primary data collection methods, which consisted of questionnaires and an interview guide. The questionnaires were administered to the 290

trainers, while the 10 principals and 10 bursars were taken through an interview by the researcher at their own convenience. The questionnaires were preferred for this study due to their anonymity, thus boosting the confidence of the respondents to respond to the questions. It is also convenient and flexible for the respondents to choose when and where to complete the questionnaire and return it to the researcher.

On the other hand, interviews were conducted using a structured guide. Interviews are typically more suitable for smaller samples from the target population, ensuring that each participant is assessed consistently thus reducing the risk of bias during the interview process. Furthermore, the researcher aimed to align the interview questions with the content covered in the questionnaires, thereby ensuring that each aspect of the research objectives was addressed consistently in both data collection methods.

3.7.1 Trainers' Questionnaire

The lecturer's questionnaire consisted of statements that reflected the research objectives of the study. These objectives primarily revolved around assessing the extent of ICT integration in various aspects, including administrative functions, financial management, instructional processes and assessment practices within Technical Training Institutions (TTIs) in Nyeri and Nairobi Counties, Kenya.

The lecturer's questionnaire consisted of five sections. Part A consisted of seven items on the respondents' demographic information. Section B consisted of nine items in a five-point likert scale and sought to gather data with regard to ICT integration in administrative functions for TTIs in Nyeri and Nairobi counties. Section C consisted of 9 statements with regards to integration of ICT in financial management for TTIs in

Nyeri and Nairobi counties. Section D comprised of nine items on integration of ICT in instructional processes for TTIs Nyeri and Nairobi counties. Section E had nine items on integration of ICT in assessment processes in TTIs in Nyeri and Nairobi counties

3.7.3 Bursars Interview Schedule

The interview guide for the bursars aimed to gather information concerning the extent of ICT integration in administrative functions, financial management, instructional procedures and assessment methods within Technical Training Institutes (TTIs) located in Nyeri and Nairobi Counties, Kenya. The interview guide for the bursars was designed to elicit information concerning the incorporation of ICT in administrative functions, the allocation of budgets for Enterprise Resource Planning (ERP) and Information Security Management System (ISMS). It also aimed to explore the integration of ICT in financial management, instructional management and assessment processes, along with their corresponding budget allocations.

3.7.3 Principals Interview Schedule

The principals interview schedule also attempted to address the level of ICT integration in administrative functions, financial management, instructional processes and assessmentpractices in TTIs in Nyeri and Nairobi Counties, Kenya. The principals interview schedule consisted of 11 open-ended questions on ICT integration in administrative functions, financial management, instructional management, assessment management, size of the institution and various organization outcomes. According to Creswell (2012) using both questionnaires and interview schedules generate qualitative and quantitative data which allows the researcher to simultaneously generalize results from a sample or a population, gain deeper understanding of the phenomena of interest

as well as test theoretical models based on participants' responses.

3.8 Reliability and Validity of the Research Instruments

The researcher ensured the reliability and validity of the instruments in the following ways;

3.8.1 Reliability of Research Instruments

Prior to data collection, the instruments' reliability was established. Reliability, as defined by Morin (2013), refers to the consistency of measurement, indicating the degree to which results are consistent across different forms of the same instrument or data collection instances. It also signifies how measures are devoid of errors (Grabowski & Oh, 2018). An instrument is deemed reliable if it yields dependable and trustworthy results (Zohrabi, 2013).

To ensure reliability, the instruments were administered to 29 trainers from neighboring Murang'a County and Thika County, selected through simple random sampling from TVET institutions. Specifically, Michuki TTI and Thika TTI were chosen for this purpose. Michuki TTI, located in Murang'a County, is representative of a rural area, while Thika TTI, situated in Kiambu County, is indicative of an urban setting. This subset constituted 10% of the initial sample in each category, a size deemed sufficient for a pilot study (Neff & Germer, 2013).

The correlation coefficient (r) between questionnaire scores was computed using Cronbach's Alpha as a measure of internal consistency, reflecting the degree of interrelatedness among a set of items. This is commonly used to assess scale reliability.

As stipulated by George and Mallery (2012), the reliability of constructs is deemed acceptable based on the following criteria: an alpha value exceeding 0.90 is excellent, a range between 0.70 and 0.90 is considered good, a value between 0.50 and 0.70 is categorized as moderate and values below 0.50 are considered poor. A threshold score of 0.7 is typically established as a cutoff for including items in the study (Cronbach & Richard, 2004).

The Cronbach alpha of 0.82 was arrived at for administrative functions, Cronbach alpha of 0.75 for financial management, Cronbach alpha of 0.78 of Instructional processes and Cronbach alpha 0.72 for assessment practices. These values were above the threshold of 0.7 which implied that the research instrument was reliable.

3.8.2 Validity of Research Instruments

To ensure the instruments measured what they were intended to measure, steps were taken to establish their validity. As described by Bhattacherjee (2012), validity refers to the extent to which an instrument accurately gauges its intended measurements. The tools utilized in this study underwent validation through content and face assessment, overseen by my supervisors.

Content validity pertains to the degree to which ameasuring instrument sufficiently encompasses the subject matter under examination. Responses gathered from the pilot study were analyzed to confirm the clarity andcomprehensibility of each item for respondents, considering their meanings and vocabulary. The pilot sample also facilitated the computation of the reliabilitycoefficient. The content validity of the instruments was supported by ensuring that theitems thoroughly covered all aspects of

the variables being investigated.

Following this, the instruments were subjected to evaluation by experts. They were presented to supervisors for review and subsequently adjusted based on their input. As Ojera (2011) elaborates, validity involves a subjective evaluation of the alignment between individual items and the concept through assessment by professional evaluators. In essence, content validity ensures that a measuring instrument adequately encompasses the scope of the subject under scrutiny. Also, factor analyses were carried out to ascertain whether or not the variables were accurate.

3.9 Data Collection Procedures

Prior to collecting the actual data, a series of preparatory steps were taken. Initially, formal permission was obtained from both the Dean of the School of Education and Social Sciences as well as the Director of Post Graduate Studies at Karatina University. Subsequently, the university authorization letters were utilized to initiate an application for a research permit from the National Commission for Science Technology and Innovation (NACOSTI). This was granted.

Following this, the researcher proceeded to secure additional authorization from the respective county Directors of TVETs. Subsequently, visits were conducted to the selected TVET institutions to establish a rapport with the principals, elucidate the study's purpose, establish trainers' distribution per Department to arrive at appropriate representation of questionnaires and coordinate a suitable date for interviews and data collection. On the designated date, the researcher with two assistants administered the research instruments to the chosen participants at the institution. Subsequent

arrangements were made to pick the questionnaires the same day after they were completed.

3.10 Data Analysis

This section outlined the methods employed for analyzing both quantitative and qualitative data. The quantitative data primarily originated from the questionnaires, while the qualitative data was predominantly derived from the interview schedule.

3.10.1 Quantitative Data Analysis

Quantitative analysis involves mathematical computations related to distinct aspects of a phenomenon (Sheard & Donaldson 2018). Thus, it entailed employing numerical data and statistical methods to achieve precise measurements of variables within the research. Information obtained from the questionnaires underwent initial entry into MS Excel for editing, coding, categorization and eliminating blank responses. Subsequently, the data was input into the SPSS statistical software for analysis. The SPSS statistical software is widely preferred by many researchers since it is menu-driven and easy to use.

In this study, both descriptive and inferential statistics were employed. The descriptive statistics comprised measurements such as frequencies, means and percentage averages. Frequencies were employed to assess the degree of agreement among the responses, while the mean was used to summarize the level of agreement with the statements, a summary that was further supported by percentage averages.

Inferential statistics utilized included t-test analysis and analysis of variance (ANOVA).

The t-test analysis was utilized to compare the degree of ICT integration in administrative functions, financial management, instructional processes and assessment practices between Nairobi and Nyeri counties. On the other hand, the analysis of variance served to evaluate the statistical significance between the independent and dependent variables.

3.10.2 Qualitative Data Analysis

The study further adopted an inductive approach for qualitative data analysis, which implies that the analysis structure was derived from the collected data itself without adhering to a pre-established framework. Initially, the interview guide was organized by broad themes, facilitating data collection and the subsequent review of individual responses to identify key concepts. Data processing was carried out manually, employing a thematic content analysis technique that followed a focus-by-question method.

The approach was used to analyze the responses to individual items in the interview guide and identify themes, their consistencies and their differences. The responses were then summarized and parallels were drawn. Such analysis allowed themes and categories to be explicit by themselves from the data and were regularly adjusted as new categories evolved.

3.11 Ethical Issues and their Considerations

This research followed ethical protocols through the implementation of the following measures. Initially, authorization was sought from the university and a research permit was obtained from NACOSTI. Only after receiving approval did the data collection

process commence. Further authorization was sought from TVET County Directors Furthermore, the researcher provided the management of the selected TTIs with a university-issued introduction letter. Consent forms were distributed to all participants to ensure their participation in the data collection process was voluntary, confidential and anonymous. This informed consent aimed to safeguard research participants concerning matters of personal exposure and confidentiality. The study's objectives were explained to respondents and they were guided through the questions to enhance comprehension and address any queries.

Throughout the entire study, participant identities were kept confidential. Participants were granted the autonomy to respond to inquiries or withdraw from the process at any juncture. The research process did not involve any form of harassment or inducement for participants. Contacts with participants were established at appropriate times and locations. There were no efforts made to extend the interview duration beyond the initially agreed-upon timeframe unless freely suggested by the participants themselves. The researcher reassured participants that the gathered data would solely be used for this particular academic purpose.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

In this chapter, the results of the study based on the data collected through questionnaires and interviews are presented and discussed as per the objectives of the study. Descriptive analysis and the inferential analysis are presented in form of tables and figures. The interpretation of inferential analysis statistical significance was based on the p-values ($p<0.05$). Relevant discussions are made to establish whether the study findings are consistent or contradict prior empirical studies.

4.2 Response Rate

A total of 290 questionnaires were disseminated for the study. The response rate for the interview guides, which were administered to 10 principals and 10 bursars, was 100%. Among the 290 questionnaires given to the trainers, 242 were completed accurately, resulting in a response rate of 83.45%. However, 48 questionnaires (equivalent to 16.55%) were not returned. According to Rowley (2014), a response rate exceeding 70% is considered satisfactory for both descriptive studies and data analysis. Therefore, the obtained response rate of 83.45% was deemed sufficient for data analysis in this study. Furthermore, the notably high response rate can be attributed to the effective training of data collectors and the diligent monitoring of questionnaires and particularly collecting immediately they were filled.

Table 4.1: Response Rate

Response Rate	Number	Frequency (Returned)	Unreturned
Questionnaires (Trainers)	290	242 (83.45%)	48 (16.55%)
Interview guide (Bursars)	10	10 (100%)	0 (0%)
Interview guide (Principals)	10	10 (100%)	0 (0%)
Total	**310**	**262 (84.52%)**	**48 (15.48%)**

4.3 Demographic Data

This section discussed the demographic characteristics of the respondents. The study examined various demographic characteristics which included; the trainers' gender, the type of Technical Training Institutes (TTIs) they worked in, their level of ICT training, teaching experience since their initial employment, availability of a laptop or computer at home, their opinions regarding ICT integration and the frequency with which they used ICT in their work-related functions. These demographic variables were incorporated to provide the researcher with insights into the trainers' background characteristics.

4.3.1 Gender of the Trainers

The respondents were requested to specify their gender and the results are illustrated in Figure 4.1 below.

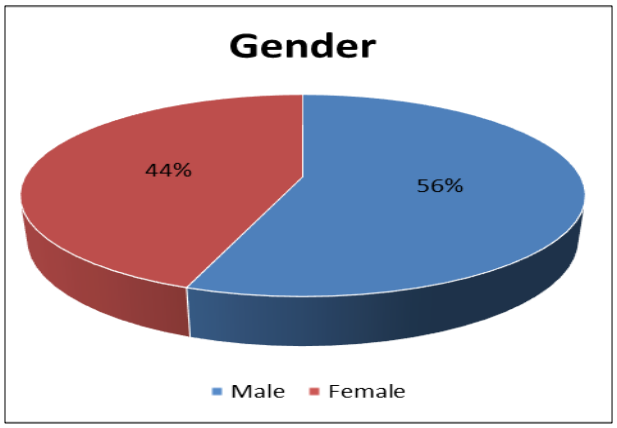

Figure 4.1: Gender of the Trainers

The findings presented in Figure 4.1 reveal that 56% of the participants were male, while 44% were female. These results corroborated the results reported by Chidobi (2015), which indicated that 68% were male and 32% were female. Additionally, a study conducted by Juma et al. (2016) also found that 66% of the participants were male and 34% were female staff members within private technical institutions. This suggests that the study included a balanced representation of both male and female trainers.

4.3.2 Category of TTIs

The trainers were asked to indicate about the category of their respective TTIs and the results of the findings are presented in Figure 4.2 below.

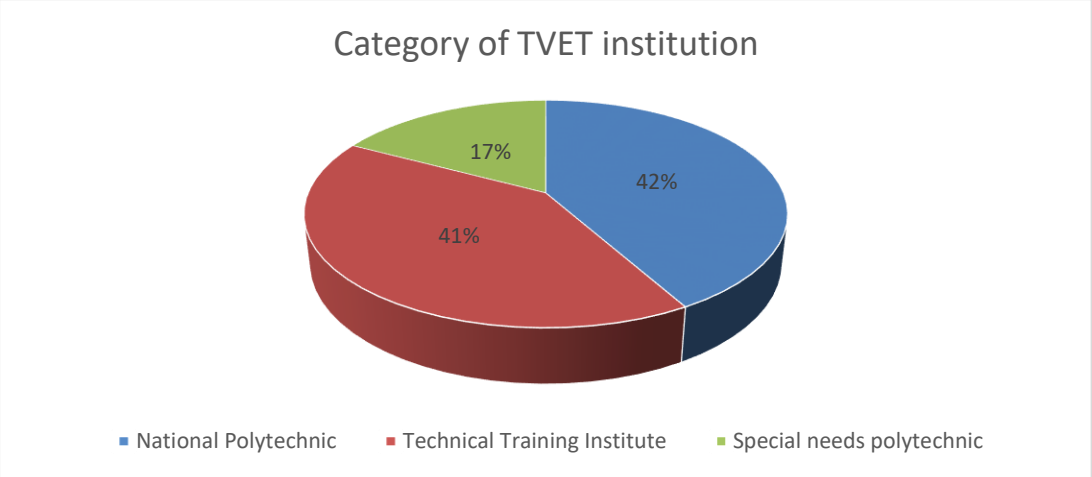

Figure 4.2: Category of TTIs

The results depicted in Figure 4.2 indicated that 42% of the participants were working at a National Polytechnic, 41% at a Technical Training Institute and 17% at a Special Needs Polytechnic. These results were consistent with the findings of Kipchumba (2021), which revealed that 56% of the participants were employed in National Polytechnics and 44% were working in Technical Training Institutes. Additionally, research conducted by Mwangi (2016) also found out that 77% of the participants were

employed in public technical institutions, whereas 23% worked in private technical institutions. This suggests that National Polytechnics and Technical Training Institutes have a larger number of trainers compared to Special Needs Polytechnics. This discrepancy is due to the large student population found in National Polytechnics and Technical Training Institutes in comparison to that in Special Needs Polytechnics.

4.3.3 Level of ICT Training

Respondents were asked to identify their highest level of ICT training. Figure 4.3 depicts a summary of the results.

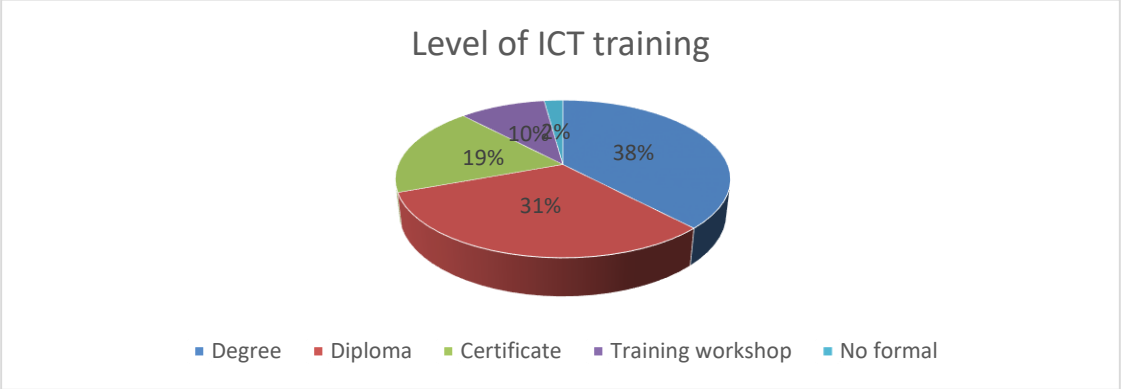

Figure 4.3: Level of ICT Training

The findings of the study revealed that 6% of the participants had a degree in ICT area of training, while 10% had a diploma in ICT area of training, 49% had a certificate in ICT training, 35% acquired ICT skills through training workshops and 2% lacked formal ICT training. These results were not consistent with those of Murgor (2013), who found out that 49% of the participants had a degree as their highest educational attainment, 33% had a diploma and 18% had a master's degree.

The study by Maina (2018) indicated that 41% of the participants had a diploma as

their highest level of education in ICT, followed by 24% with a degree, 20% with a Master's degree in ICT and 15% with a certificate in ICT. The findings were acceptable as many of the Trainersrespondents were identified across all departments in a given institution which required other content qualifications for one to train.

4.3.4 Teaching Experience in TTIs

The trainers' teaching experience in Technical Training Institutes (TTIs) was investigated and the results are illustrated in Figure 4.4 below.

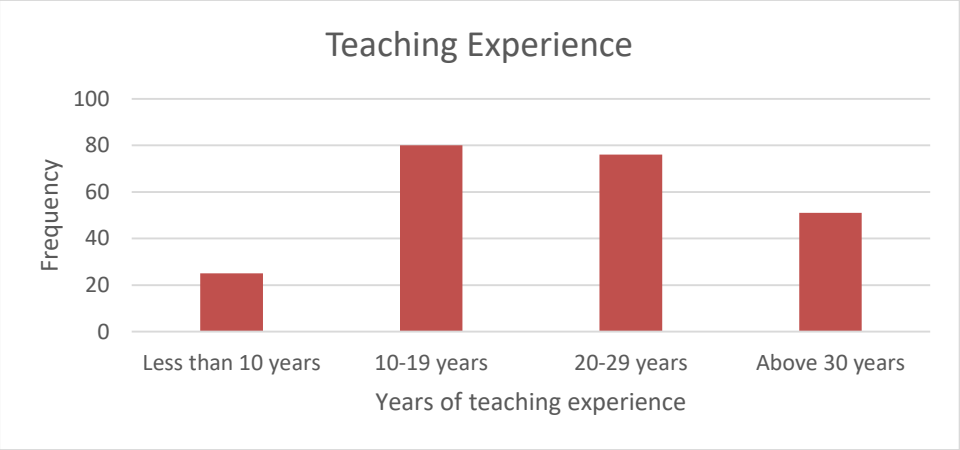

Figure 4.4: Teaching Experience in TTIs

The majority of respondents (34%) had a teaching experience between 10 and 19 years, followed by 33% who had a teaching experience between 20 and 29 years, then 22% who had a teaching experience of more than 30 years and finally 11% who had a teaching experience of less than 10 years. These results were comparable to those of Mwalongo (2011), who found that 45.50 % of the trainers had between 5 and 10 years of experience, 40.90 percent had between 11 and 15 years of experience and 13.60 percent had over 15 years of experience. In addition, the study by Obwoge and Kibor (2016) revealed that 52% of the trainers had between 5 and 10 years of work experience, 37% had between 11 and 15 years of work experience and 11% had over 15 years of

work experience. These results indicated that ICT work experience is emphasized heavily in the employment descriptions of TVET institutions.

4.3.5 Access to a Laptop or Computer at home

The respondents were asked to indicate if they have access to a laptop or computer at their home. The findings are presented in Figure 4.5.

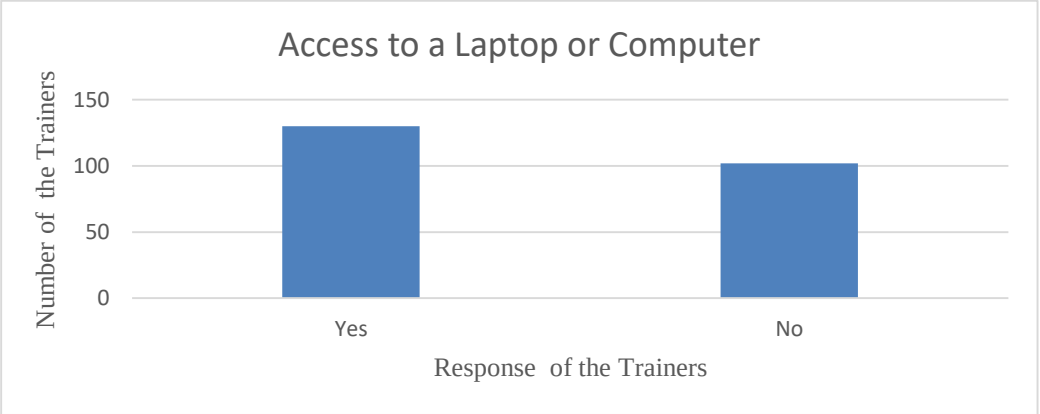

Figure 4.5: Access to a laptop or computer at home

The findings showed that 56% of the respondents reported having access to a laptop or computer in their homes, whilst 44% reported lacking access. This implies that a significant portion of trainers continue to encounter difficulties in obtaining personal access to a laptop or desktop computer within their homes. These findings are further corroborated by the research conducted by Kiplangat (2021), who observed that a significant proportion of trainers (60.72%) in Technical and Vocational Education and Training (TVET) institutes in Tranzoia lacked access to computers within their respective establishments.

The findings suggest that limited access to laptops orcomputers may have impeded the extent to which information and communication technology (ICT) is integrated in

management of Technical Training Institutes (TTIs) in Nyeri and Nairobi counties.

4.3.6 Opinion on ICT Integration to Address Training and Administrative issues

Participants were asked to express their opinions regarding the incorporation of ICT to assist in managing training and administrative issues. Figure 4.6 provides a summary of the findings.

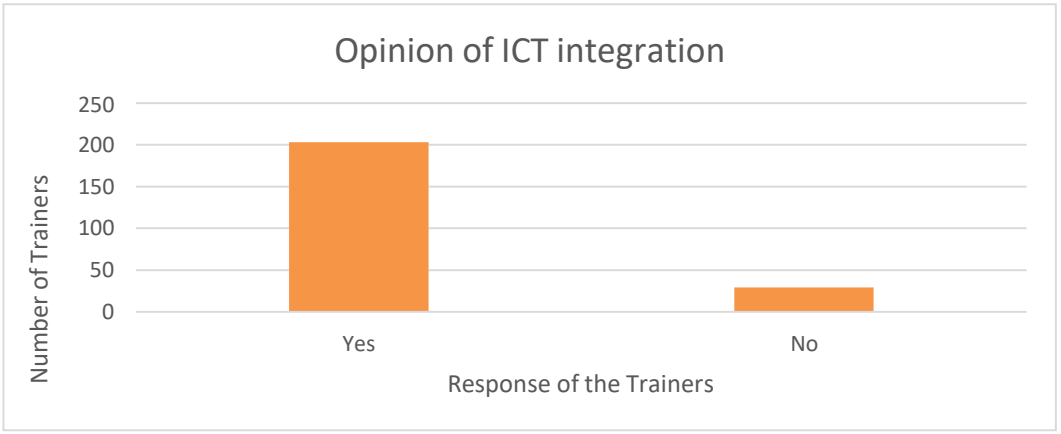

Figure 4.6: Opinion on Integration of ICT to Address Training and Administrative Issues

The results displayed in Figure 4.6 revealed that 87% of the respondents held the view that incorporating ICT aids in addressing training and administrative matters, while 13% expressed disagreement. These findings were supported by a study conducted by Maina, Mwai and Ogalo in 2016, which pointed out that significant efforts had been made by researchers and educators to equip teachers at Michuki and Thika Technical Training Institutes in Murang'a and Kiambu Counties, respectively, with education-focused ICT training. Similarly, Mwangi (2016) indicated that 80% of the participants concurred with the notion that integrating ICT had positively impacted the management of Technical Training Institutes (TTIs) in Nairobi County. This suggests that trainers

across various TTIs in Kenya's counties widely support the integration of ICT to enhance their work, particularly in instructional and assessment practices.

4.3.7 Frequency of Use of ICT in Conducting Work Related Functions

The study examined the frequency with which respondents use ICT for work-related duties. These findings were graphically presented in figure 4.7.

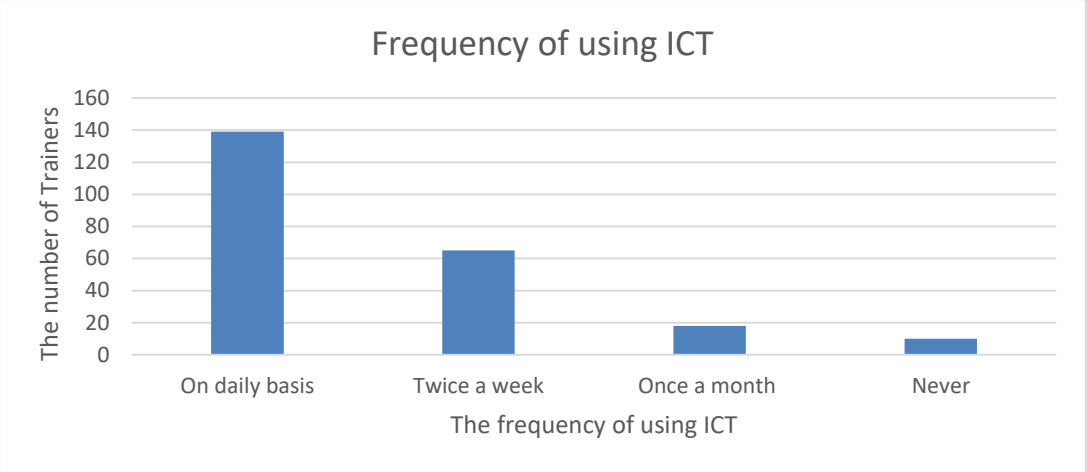

Figure 4.7: Frequency of Use of ICT in Conducting Work Related Functions

The results of the survey revealed that a majority of the participants, specifically 60%, reported utilizing ICT on a daily basis. Additionally, 28% of respondents reported using ICT twice in a week. Furthermore, it was found that 8% of respondents used ICT on a monthly basis, whilst 4% reported never utilizing ICT for work-related purposes. These results were consistent with the findings of Maina, Mwai and Ogalo (2016), who reported that 65% of trainers regularly used ICT in their functions, while 35% infrequently utilized computers for work.

Moreover, a study conducted by Obwoge and Kibor (2016) corroborated these findings revealing that 70% of trainers utilized computers in their work, while only 30% infrequently used computers. This suggests that a substantial number of Technicaland

Vocational Education and Training (TVET) institutions in Nairobi and Nyeri have invested significantly in establishing ICT systems and labs for facilitating trainers' utilization of technology for work-related duties.

4.4 Results of the Reliability and Validity of the Research Instruments

Prior to transforming the Likert scale data into continuous data, the researcher carried out a series of tests, which included examination of reliability and assessment of the validity of individual variables.

4.4.1 Reliability Analysis of the Individual Variables

Cronbach Alpha was utilized to assess the reliability of the questionnaires administered to both trainers and finance officers. Following the criteria set by George and Mallery (2012), the constructs' reliability was evaluated. When the Cronbach's alpha value exceeds 0.90, it is considered excellent; values falling between 0.70 and 0.90 are regarded as good; those within the range of 0.50 to 0.70 are deemed moderate and values below 0.50 are considered poor. The results of the variables derived from the trainers' questionnaires are displayed in Table 4.2 below.

Table 4.2: Reliability Coefficients (Cronbach Alpha) for all Variables

Variable	No of Items	Cronbach Alpha Value	Remarks
Administrative functions	9	0.941	Excellent
Financial management	9	0.929	Excellent
Instructional processes	9	0.922	Excellent
Assessment practices	9	0.913	Excellent
Management	9	0.81	Good

Results presented in Table 4.2 indicated that the independent variables (administrative functions, financial management, instructional processes and assessment practices) all exhibited a Cronbach Alpha value exceeding 0.90, indicating their suitability for further analysis and transformation. The dependent variable, management, attained a Cronbach Alpha value of 0.81, thereby being considered good for subsequent analysis and transformation.

4.4.2 Validity Analysis of Individual Variables

The researcher employed the KMO-Bartlett's test of sphericity to assess the validity of the individual variables within both the trainers' and Bursars' questionnaires. Following the guidance of Napitupulu et al. (2017), KMO values approaching 1.0 are considered optimal, while values falling below 0.5 are deemed inadequate. Therefore, a KMO value greater than 0.5 is necessary to ensure a satisfactory foundation for subsequent factor analysis. Table 4.3 presents results from analysis.

Table 4.3: Validity Analysis of Individual Variables from the Trainers' Questionnaire

Variable	KMO	Bartlett's Test of Sphericity		
		Approx. Chi Square	Df	Sig
Administrative functions	0.956	1419.21	36	0.000
Financial management	0.947	1282.08	36	0.000
Instructional processes	0.944	1178.79	36	0.000
Assessment practices	0.930	1097.16	36	0.000
Management	0.884	846.68	36	0.000

The findings showed that all variables possessed KMO values exceeding 0.5 and the Bartlett's test of sphericity for all variables was statistically significant. As a result, all variables were considered appropriate for further analysis, demonstrating their adequacy for further analysis.

4.5 ICT Integration in Administrative Functions

The first objective of the study was to evaluate the level of ICT integration in administrative functions between TTIs in Nyeri and Nairobi counties in Kenya. Respondents gave their views on a Likert scale with five (5) scales beginning with strongly agree, agree, moderately agree, disagree and strongly disagree. Table 4.4 presents the findings.

Table 4.4: The Level of ICT Integration in Administrative Functions

Statements	SD	D	MA	A	SA	$\bar{x}$	PA
The institution heavily invests in Enterprise Resource Processing systems (ERP).	8.19%	14.66%	17.24%	34.91%	25.00%	3.54	70.8%
The institution has invested in training staff who	6.03%	12.50%	18.97%	31.90%	30.60%	3.69	73.8%

operate ERP systems.							
The institution has invested in hardware used to run ERP systems.	5.60%	11.21%	19.83%	37.07%	26.29%	3.67	73.4%
The institution heavily invests in Information Security Management Systems (ISMS).	8.19%	9.48%	16.38%	36.21%	29.74%	3.7	74%
The institution has invested in training staff who operate the ISMS.	9.91%	7.33%	17.67%	34.91%	30.17%	3.68	73.6%
The institution has invested in hardware used to run the ISMS.	13.79%	12.07%	12.07%	31.90%	30.17%	3.53	70.6%
	12.50%	17.24%	21.12%	27.59%	21.55%	3.28	65.6%

The institution heavily invests in business telephone systems							
The institution has invested in training staff who operate the business telephone systems.	2.59%	8.19%	13.79%	42.24%	33.19%	3.95	79%
The institution has invested in hardware used to operate the business telephone systems.	9.91%	10.78%	15.09%	34.05%	30.17%	3.64	72.8%

Key: SD-Strongly Disagree, D-Disagree, MA-Moderately Agree, A-Agree, SA-Strongly Agree, x̄- Mean, PA- Percentage Average

The results regarding whether institutions heavily invested in enterprise resource planning (ERP) systems revealed that 25% of the respondents strongly agreed, 34.91% agreed and 17.24% moderately agreed. In addition, 14.66% disagreed and 8.19% strongly disagreed. The percentage average of all the responses was 70.8, implying that

most of the respondents (77.15%) agreed that TTIs heavily invest in ERP systems. This was supported by an interviewee who said the following;

> ...Investing in ERP systems has become a necessity for educational institutions. It helps in managing resources efficiently, improving data management and enhancing various administrative functions. This not only benefits the institution's operations but also contributes to the overall quality of education provided… *Principal participant.*

> …From a financial perspective, ERP systems have been a game-changer. They've streamlined budgeting, expense tracking and financial reporting, making our financial management much more efficient. It has not only reduced manual errors but also allowed us to allocate resources more effectively... *Bursar participant.*

This implies that most of the TVET institution in the two counties heavily invest in ERP systems. Similarly, Hoques et al. (2012) study showed that the majority of schools in Malaysia are well and adequately equipped with ICT facilities. However, ICT was mainly used for administrative purposes and teacher preparation rather than imparting skills to learners.

The results on whether the institution has invested in training staff who operate ERP systems also indicated that 30.60% of the respondents strongly agreed, 31.90% agreed and 18.97% moderately agreed. Moreover, 12.50% disagreed and 6.03% strongly disagreed. The percentage average of all the responses was 73.8%, implying that most of the respondents (81.47%) agreed that the institution has invested in training staff

who operate ERP systems. This was supported by an interviewee who responded as follows;

> …Effective training not only improves our staff's digital competence but also empowers them to harness the full potential of ERP systems. It's clear that our institution recognizes the importance of this and is taking the necessary steps to ensure that our staff can leverage these systems for the benefit of our students and the entire organization…. *Principal participant.*

> …Well-trained staff can make the most of ERP systems, leading to greater efficiency and accuracy in our financial operations. It's encouraging to know that the institution places importance on staff training in this area… *Bursar participant.*

However, Onguko (2016) study revealed that many attempts to equip learning institutions with ICT devices as well as teacher training have often not been accompanied by adequate research or tracking of on progress ICT policy implementation. This implies that, though there have been efforts to invest in ICT devices and teacher training, there is still a need to review the ICT policies implemented.

Further, the findings determining whether institutions have invested in hardware used to run ERP systems indicated that 26.29%, 37.07% and 19.83% of the respondents strongly agreed, agreed and moderately agreed, respectively. On the other hand, 5.60% and 11.21% strongly disagreed and disagreed, respectively. The percentage average of the responses was 73.4%, revealing that most of the respondents (83.19%) agreed that

the institution has invested in hardware used to run ERP systems. This was supported by an interviewee who had the following to say;

> …Investing in hardware is a fundamental aspect of ensuring that ERP systems can function effectively. It's pleasing to see that our institution is committed to providing the necessary technological infrastructure to support these systems. This investment not only improves administrative processes but also contributes to the overall efficiency and quality of our educational services… *Principal participant.*

Chepkoech and Mwinzi (2016) also outlined that there should be an enhancement in the provision of ICT facilities such as audio-visuals, application software and networking facilities, which are still a challenge in technical institutions.

The results also found that 29.74%, 36.21% and 16.38% of the respondents moderately agreed, agreed, or strongly agreed with the statement that the institution invests in information security management systems (ISMS). While 9.48% and 8.19% disagreed and strongly disagreed respectively. This implied that most of the respondents (82.33%) agreed that the institution invests in information security management systems (ISMS). and this was confirmed by the percentage average of all the responses, which was 74%. This was supported by an interviewee who put that;

> …ISMS plays a vital role in ensuring the confidentiality, integrity and availability of our digital assets and information. It's reassuring to know that our institution is proactively addressing these concerns. This investment not only enhances data security but also aligns with our responsibility to protect the information entrusted to us… *Principal participant.*

Kiboi (2014) further noted that donated ICT equipment in colleges was in good

condition and accessible, but technical support was not adequate, which translated to low integration of ICT in the management, contrary to expectations.

Moreover, the results that assessed whether the institution has invested in training staff who operate the ISMS found that 30.17% strongly agreed, 34.91% agreed and 17.67% moderately agreed. Additionally, 7.33% of the respondents disagreed and 9.91% of the respondents strongly disagreed. This meant that most of the respondents (82.75%) agreed with the statement, as demonstrated by the percentage average of the responses at 73.6%. This was further supported by an interviewee who expressed the following;

> …. Institution has indeed invested in training staff who operate the Information Security Management System (ISMS). Information security is a critical aspect of our institution's operations and we recognize the importance of ensuring that our staff are well-prepared to manage and maintain the ISMS effectively…… *Principal participant.*

However, Onguko (2016) study revealed that many attempts to equip learning institutions with ICT devices as well as teacher training have often not been accompanied by adequate research or tracking of on progress of ICT policy implementation. This implies that, though there have been efforts to invest in ICT devices and teacher training, there is still a need to review the ICT policies implemented.

Furthermore, 30.17% strongly agreed, 31.90% agreed and 12.07% moderately agreed with the statement that the institution has invested in hardware used to run the ISMS. While 13.79% and 12.07% strongly disagreed and disagreed, respectively. The percentage average of the responses was 70.6%, meaning that most of the respondents

(74.14%) agreed that the institution has invested in hardware used to run the ISMS. This was supported by an interviewee who had the following to say;

> …the institution has invested in the hardware required to operate the Information Security Management System (ISMS). Ensuring that the ISMS runs on reliable and secure hardware is crucial to maintaining the security and integrity of our digital assets and sensitive information… *Principal participant.*

Chepkoech and Mwinzi (2016) also outlined that there should be an enhancement in the provision of ICT facilities such as audio-visuals, application software and networking facilities, which are still a challenge in technical institutions.

The results also found that 21.55%, 27.59% and 21.12% of the respondents strongly agreed, agreed, or moderately agreed respectively that the institution heavily invests in business telephone systems. While 17.24% and 12.50% disagreed and strongly disagreed respectively. The percentage average of the responses was 65.6%, implying that the majority of the respondents (70.26%) agreed that the institution heavily invests in business telephone systems. This was supported by an interviewee who noted the following;

> …Investing in modern telephone systems is not just about technology; it's about improving communication, accessibility and the overall efficiency of our institution. Whether it's addressing inquiries, coordinating events, or ensuring safety through emergency communication, a robust telephone system plays a vital role… *Principal participant.*

Similarly, Lim (2017) reported that despite ICT equipment availability, internet connectivity was very poor, especially in rural areas, whereas the ICT infrastructure is

largely well established in the institutions that are within the precincts of urban areas such as Kigali.

On the other hand, 33.19%, 42.24% and 13.79% of the respondents strongly agreed, agreed and moderately agreed, respectively, that the institution has invested in training staff who operate the business telephone systems. While 8.19% and 2.59% disagreed and strongly disagreed, respectively. The percentage average of the responses was 79%, implying that the majority of the respondents (89.22%) agreed that the institution has invested in training staff who operate the business telephone systems. This was supported by an interviewee who expressed the following;

> …Investing in training for the staff who operate our business telephone systems is a priority for our institution. It's not just about having advanced technology; it's also about ensuring that our staff can utilize it to its fullest potential… *Principal participant.*

However, Onguko (2016) study revealed that many attempts to equip learning institutions with ICT devices as well as teacher training have often not been accompanied by adequate research or tracking of on progress of ICT policy implementation. This implies that, though there have been efforts to invest in ICT devices and teacher training, there is still a need to review the ICT policies implemented.

In addition, the results regarding whether the institution has invested in hardware used to operate the business telephone systems also indicated that 30.17% strongly agreed, 34.05% agreed and 15.09% moderately agreed. While 10.78% and 9.91% disagreed and strongly disagreed, respectively. The percentage average of the responses was

72.8%, meaning that most of the respondents (79.31%) agreed that the institution has invested in hardware used to operate the business telephone systems. This was supported by an interviewee who had explained as follows;

> …institution has made investments in the hardware necessary to operate our business telephone systems effectively. This investment is a fundamental part of ensuring that our communication infrastructure remains reliable and can support our daily operations… *Principal participant.*

However, these findings were in disagreement with those of Kukali's (2013) study, which revealed that in developing countries, most rural and informal urban settings may lack electricity and internet connections, as well as capacity to meet maintenance costs.

These findings were in agreement with Pavlova (2018) argument, which stipulated that ICT plays a vital role in supporting powerful and efficient administration in the education sector. It can be used for everything from student and staff administration to institutional and community engagements in an educational institution.

Further, the principals and bursars who were interviewed were also requested to give their opinion with regard to administrative functions;

> 70% of the principals confirmed that the trainers view ICT integration as an efficient mode of teaching that is convenient and efficient for them and their students. Whereas,80% of the bursars agreed that more than 10% of the total institutional budget is allocated for the ERP, ISMS and business telephone systems used in administrative functions.
>
> 60% of the principals also revealed that integration of ERP system in their TTIs

has assisted in streamlining their administrative functions including financial and student records and HR functions which in return has greatly improved efficiency and decision-making. On the other hand, 7 (70%) of the bursars concurred that the use of ISMS has been quite beneficial in terms of information security especially protecting sensitive student data and financial records.

90% of the principals' investment in a modern business telephone system has improved our communication with students, staff and external stakeholders. Additionally, 8 (80%) agreed that the use of a centralized modern telephone system has enhanced communication accessibility and professionalism in TTIs.

4.5.1 Results of Test of Hypothesis in Level of ICT Integration in Administrative Functions

The hypotheses were tested at a 5% significance level and the rejection/acceptance decision were determined by p values of the study against 0.05 level of significance. The first null hypothesis stated that;

$H0_1$: There is no statistically significant difference between the level of ICT integration in administrative functions in TTIs in Nyeri and Nairobi Counties in Kenya

The mean percentage with respect to the level of ICT integration in performance of administrative functions indicated that Nyeri had 41.91% while Nairobi had 58.16% as presented in Figure 4.8 below.

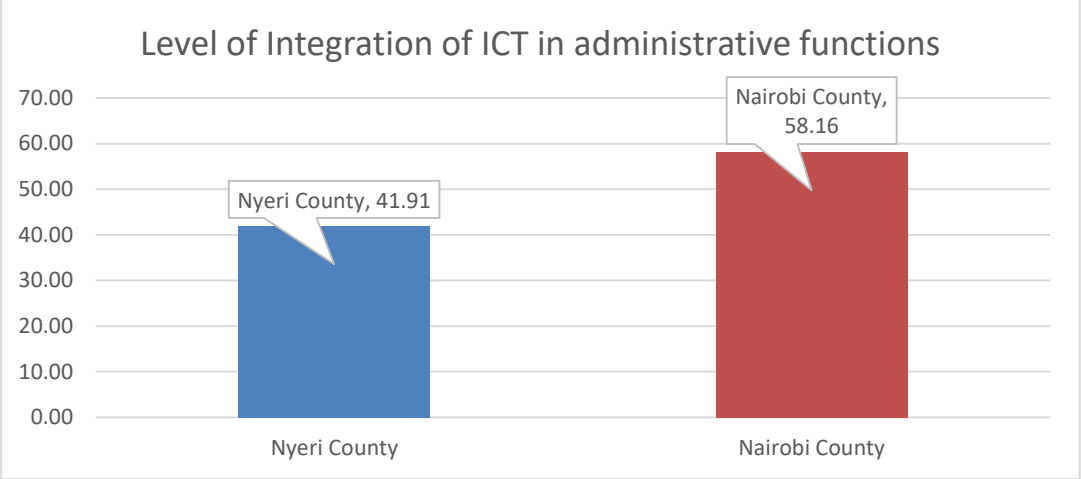

Figure 4.8: Level of ICT Integration in Administrative Functions for TTIs in Nyeri and Nairobi Counties

To determine whether there existed a statistically significant difference in the level of ICT integration in administrative duties between TTIs in Nyeri and Nairobi the Counties, a t-test was conducted and the results are presented in Table 4.5 below.

Table 4.5: T-test Analysis for ICT Integration in Administrative Functions

Variables	Counties	Percent %	Mean	T-statistic	P-value
Av Administrative functions	Nyeri	41.91	2.464158	0.086959	0.000
	Nairobi	58.16	3.419753	0.11304	
	Total	100	5.88	0.076753	

Results above indicated that there was a statistically significance difference (t=0.077, p=0.000) in the level of ICT integration in administrative functions between TTIs in Nyeri and NairobiCounty. The null hypothesis was hence rejected. The implication here

is that the level of ICT integration in administrative functions is lower in TTIs in Nyeri county than in TTIs in Nairobi County. This observation could be linked to prevalence of internet connectivity in urban areas more than rural areas. Most administrative processes require good Internet connectivity to succeed.

These findings concurred with those of Lim (2017) study which reported that despite ICT equipment availability, internet connectivity was very poor especially in rural areas. Whereas, the ICT infrastructure is largely well established in the institutions that are within the precincts of urban areas such as Kigali. Additionally, these findings agreed with those of Karanja, Sang and Ndirangu (2018) study as it established that use of modern technology in administrative processes like student record management and financial management has significantly improved the overall administrative efficiency within TTIs.

4.6 ICT Integration in Financial Management for TTIs

The study's second objective aimed to assess the level of ICT integration in financial management in Technical Training Institutes (TTIs) in Nyeri and Nairobi Counties, Kenya. The findings are presented in table 4.6 below.

Table 4.6: The Level of ICT Integration in Financial Management

Statements	SD	D	MA	A	SA	$\bar{x}$	PA
The institution invests heavily e-procurement systems.	8.70 %	12.10 %	20.70 %	32.20 %	26.30 %	3.31	66.2 %
The institution has invested in	9.50 %	15.00 %	24.10 %	29.80 %	21.60 %	3.31	66.2 %

training of staff who operate the e-procurement systems.							
The institution has invested in hardware used to operate e-procurement systems.	10.70 %	14.70 %	22.40 %	30.20 %	22.00 %	3.38	67.6 %
The institution invests heavily in automated budgeting systems.	8.50 %	21.60 %	19.00 %	28.10 %	22.80 %	3.23	64.6 %
The institution has invested in training of staff who operate the automated budgeting systems.	9.90 %	12.90 %	22.40 %	32.00 %	22.80 %	3.35	67%
The institution has put in place policies for managing automated budgeting systems.	5.50 %	18.10 %	22.80 %	33.70 %	19.90 %	3.34	66.8 %
The institution invests heavily in Accounting Information Systems (AIS).	7.50 %	12.10 %	22.00 %	31.00 %	27.40 %	3.39	67.8 %
The institution has invested in training of staff who operate the	6.60 %	22.00 %	21.60 %	25.70 %	24.10 %	3.4	68%

AIS.							
The institution has invested in hardware used to operate the AIS	8.50 %	15.30 %	15.70 %	31.50 %	29.00 %	3.5 7	71.4 %

Key: SD-Strongly Disagree, D-Disagree, MA-Moderately Agree, A-Agree, SA-Strongly Agree, x̄- Mean, PA- Percentage Average

The findings in Table 4.6 above regarding the level of investment in e-procurement systems within the institutions revealed that 26.30%, 32.20% and 20.70% of the participants strongly agreed, agreed and moderately agreed, respectively. Meanwhile, 12.10% disagreed and 8.70% strongly disagreed. The composite average percentage of these responses totaled 66.2%, suggesting that a significant proportion of respondents (around 79.20%) were in agreement regarding the substantial investment in e-procurement systems by the institutions. This was supported by an interviewee who had the following to say;

> …The institution has made significant investments in e-procurement systems and it's a strategic move that aligns with our commitment to efficient and transparent procurement processes. E-procurement systems are a valuable asset for our institution. They streamline the procurement process, reduce manual paperwork and help ensure compliance with regulations. These systems not only save time and resources but also enhance the overall efficiency of our procurement activities…*Bursar Participant.*

Results also revealed that 21.60%, 29.80% and 24.10% of the respondents strongly

agreed, agreed and moderately agreed respectively, with the statement that the institution has invested in training staff who operate the e-procurement systems. Conversely, 15% and 9.50% disagreed and strongly disagreed respectively. This resulted in an average percentage of responses of 66.2%, indicating that a majority of the respondents (75.50%) agreed that the institution has indeed invested in training staff to operate the e-procurement systems. This was supported by an interviewee who noted the following;

> …. E-procurement systems can be highly effective tools, but to realize their full potential, our staff needs to be well-trained in their operation. We've made sure that our procurement team is equipped with the necessary skills and knowledge to navigate these systems effectively, ensuring a smooth and efficient procurement process…. *Principal participant*

Furthermore, 22%, 30.20% and 22.40% of the participants strongly agreed, agreed and moderately agreed respectively, with the assertion that the institution had invested in the hardware necessary to operate e-procurement systems. Conversely, 14.70% and 10.70% disagreed and strongly disagreed respectively. This resulted in an average response percentage of 67.6%, indicating that a substantial majority of the respondents (approximately 74.60%) were in agreement regarding the institution's investments in the hardware needed for e-procurement systems. This was supported by an interviewee who had the following to say;

> …The institution has made substantial investments in the hardware necessary to operate our e-procurement systems. This investment is vital to ensure the smooth and reliable operation of these systems, which are central to our efficient procurement processes. The hardware infrastructure underpinning our e-procurement systems plays a crucial role in their

> functionality. It supports the storage, processing and secure transmission of procurement data. This investment allows us to carry out procurement activities seamlessly and ensures that our staff can work with these systems without any technical hindrances…. *Principal participant*

These findings were also supported by the studies of Achoka (2014) and Deya (2016), which stated that the use of ICT for finance purposes requires standard software to be installed on interlinked computers, where all transactions can be automatically logged. For example, the use of payroll systems and e-tax systems.

Furthermore, the results concerning whether the institution heavily invests in automated budgeting systems showed that 22.80% strongly agreed, 28.10% agreed and 19% moderately agreed. Meanwhile, 21.60% disagreed and 8.50% strongly disagreed. This implies that the majority of respondents (60.90%) agreed that the institution invests heavily in automated budgeting systems, a sentiment confirmed by the average response percentage of 64.6%. This was supported by an interviewee who expressed the following;

> ……The institution has indeed made substantial investments in automated budgeting systems and it's a move that has significantly enhanced our financial management and planning processes. Automated budgeting systems have revolutionized how we handle financial matters. They offer us real-time insights, streamline the budgeting process and improve the accuracy and transparency of our financial data. These investments are not only cost-effective but also boost our financial efficiency…*Bursar participant*

The findings also indicated that 22.8%, 32% and 22.4% of the participants strongly

agreed, agreed and moderately agreed respectively, with the assertion that the institution had made investments in training staff responsible for operating the automated budgeting systems. In contrast, 12.9% disagreed and 9.9% strongly disagreed. The average response percentage was 67%, indicating that most of the respondents (77.20%) agreed that the institution has invested in training staff who operate the automated budgeting systems. The findings also indicated that 22.8%, 32% and 22.4% of the participants strongly agreed, agreed and moderately agreed respectively, with the assertion that the institution had made investments in training staff responsible for operating the automated budgeting systems. In contrast, 12.9% disagreed and 9.9% strongly disagreed. This was supported by an interviewee who had the following to say in this respect;

> ….. Our staff is the backbone of our financial operations and to make the most of automated budgeting systems, they need to be well-trained. We've invested in training programs to ensure that our team is proficient in navigating and using these systems effectively…. *Principal participant*

These findings align with the study by Ngugi (2012), which emphasized that ICTs are valuable for storing and analyzing data in school financial management, including budgetary allocations, expenditures, students' fees payment and general accounting. Therefore, financial planning and control, particularly the budgeting process in TVET institutions, require the availability of multiple sources of information supported by ICTs.

The findings assessing whether institutions heavily invest in Accounting Information Systems (AIS) also indicate that 27.4% strongly agreed, 31% agreed and 22% moderately agreed. Conversely, 12.1% disagreed and 7.5% strongly disagreed. The

average response percentage was 67.8%, suggesting that most respondents (80.4%) agreed that institutions heavily invest in AIS. This was supported by an interviewee who had the following in this regard;

> …. The institution places a significant emphasis on investing in Accounting Information Systems (AIS) and this investment plays a pivotal role in the efficiency and effectiveness of our financial operations. AIS is a fundamental component of our financial management. These systems streamline financial processes, enhance data accuracy and provide us with valuable insights into our financial health. The investment in AIS not only saves time and resources but also improves the overall transparency and integrity of our financial data…. *Bursar participant*

The findings also revealed that 24.1%, 25.7% and 21.6% of the respondents strongly agreed, agreed and moderately agreed with the statement that the institutions have invested in training staff who operate the AIS. Meanwhile, 22% and 6.6% disagreed and strongly disagreed respectively. The average response percentage was 68%, indicating that most respondents (71.40%) agreed that institutions have invested in training staff who operate the AIS. This was supported by an interviewee who had the following input;

> …. The training of staff who operate our Accounting Information Systems (AIS) is a top priority for our institution. We understand that the effective utilization of these systems is essential for sound financial management and reporting….. *Principal participant*

Additionally, the results indicating whether the institution has invested in hardware used to operate the AIS showed that 29% strongly agreed, 31.5% agreed, 15.7% moderately agreed, 15.3% disagreed and 8.5% strongly disagreed. This implies that

most respondents (76.2%) agreed with the statement that the institution has invested in hardware used to operate the AIS, a sentiment confirmed by the average response percentage of 71.4%. This was supported by an interviewee who expressed the following in this regard;

> ……The hardware infrastructure is the backbone of our AIS. It supports the storage, processing and secure transmission of financial data, ensuring that our financial operations are seamless. These investments guarantee that our staff can work with AIS competently. Moreover, our commitment to investing in the necessary hardware reflects our dedication to maintaining the integrity and flow of our financial operations. It also signifies our efforts to stay current with technological advancements, which in turn enhances our institutional efficiency. ….. *Principal participant*

Similarly, the study by Binuyo and Aregbeshola (2014) revealed that ICT is the most reliable means of providing a strong platform for an effective system of internal control over financial reporting. This is because it guarantees a medium of financial information delivery that covers the entire accounting cycle of the firm. Accounting software creates transparent financial transactions.

In addition, the principals and bursars who were interviewed were also requested to give their opinion with regard to financial management;

> Sixty-three (63%) of the principals concurred that the institution has benefited from the integrationof ICT in financial management, especially in accounting services, leading to fast and improved service delivery to students. On the other hand, 92% of the bursars confirmed that more than 10% of the total institutional budget is set aside to invest in e-

procurement systems, automated budget systems and accounting information systems.

Seven (70%) of the principals also agreed that the use of e-procurement system has enabled them to track purchases efficiently and make prior orders to manage their budgets more effectively. Whereas, Eighty (80%) of the bursars noted that there has been an increased transparency in procurement processes thus reduced manual errors. That ICT integration has simplified work process.

Five (50%) of the principals highlighted that automated budget systems have significantly improved their financial planning processes which are quite time-consuming. Seven (70%) of the bursars agreed that automated budget systems have made it easier for them to track daily expenses and reduce budget variances.

4.6.1 Results of Test of Hypothesis of ICT Integration in Financial Management

The hypotheses were tested at a 5% significance level and the rejection/acceptance decision was determined by p value of the study against 0.05 level of significance. The second null hypothesis stated that;

$H0_2$: There is no statistically significant difference between the level of ICT integration in financial management in TTIs in Nyeri and Nairobi Counties in Kenya.

The mean percentage with respect to the level of ICT integration in financial management indicated that TTIs in Nyeri County had 42% while TTIs in Nairobi

County had 58% as depicted in Figure 4.9 below.

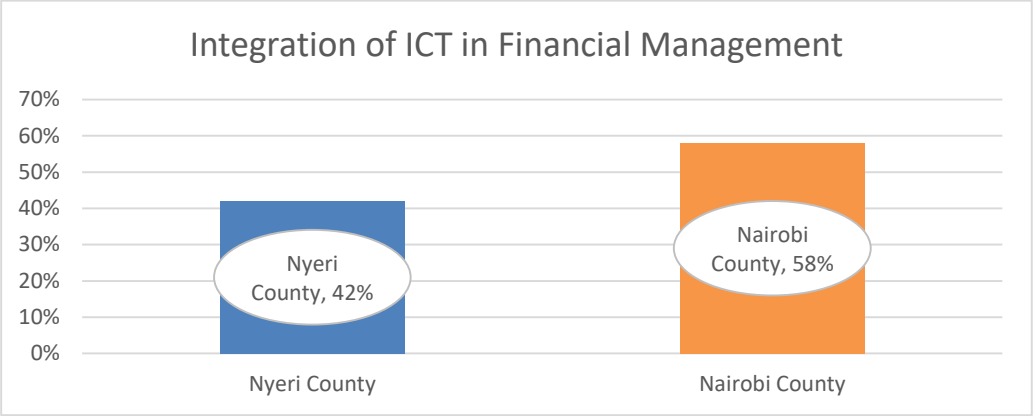

Figure 4.9: Level of Integration of ICT in Financial Management in TTIs in Nyeri and Nairobi Counties

To determine whether there existed a statistically significant difference in the level of ICT integration in financial management between TTIs in Nyeri and Nairobi Counties, a t-test was conducted and the results are presented in Table 4.7 below.

Table 4.7: T-test Analysis for ICT Integration in Financial Management

Variables	Counties	Percent %	Mean	T-statistic	P-value
Av_ Financial management	Nyeri	42%	2.52957	0.080321	0.000
	Nairobi	58%	3.492798	0.104912	
	Total		6.02	0.072172	

The results indicated that there was a statistically significant difference (t=0.072, p=0.000) in the level of ICT integration in financial management between TTIs in Nyeri and Nairobi Counties. Thus, the null hypothesis was rejected. This implies that the level of ICT integration in financial management is lower in TTIs in Nyeri county than in TTIs in Nairobi County. This observation could be linked to prevalence of internet

connectivity whereby it is higher in urban areas more than rural areas. Internet connectivity is a critical infrastructure for the success of ICT integration in financial management. These findings were in agreement with those of Mue (2014) which revealed that in general ICT is not well integrated in financial management in the rural areas.

Financial transaction is still done manually which was reported to yield inefficiencies and subjective financial operations. Whereas, Oyier et al. (2015) study which was conducted in Nairobi County but in private schools also indicated 25% of schools had automated accounts, 71.9% had automated payroll and 53.1% used ICT in budgeting operations. Thus, these findings revealed that integration of ICT in financial management has benefited TTIs in ensuring easier access to real-time access of financial data compared to manual financial records and in turn enables them make well-informed decisions.

4.7 ICT Integration in Instructional Processes

The third objective of the study was to evaluate the level of ICT integration in instructional processes in TTIs in Nyeri and Nairobi Counties in Kenya. Table 4.8 presents the findings.

Table 4.8: The Level of ICT Integration in Instructional Processes

Statements	SD	D	MA	A	SA	$\bar{x}$	PA
The institution invests heavily in e-learning systems.	6.90%	9.91%	14.22%	40.52%	28.45%	3.74	74.8%

The institution has invested in training staff who operate the e-learning systems.	7.33%	12.07%	16.81%	32.33%	31.47%	3.69	73.8%
The institution has invested in computer hardware used by e-learners.	3.88%	8.62%	15.95%	40.52%	31.03%	3.86	77.2%
The institution has invested in softwares that enable trainers to easily prepare their schemes of work and lesson plans.	7.76%	10.78%	16.81%	34.05%	30.60%	3.69	73.8%
The institution has invested in training of trainers on presentation of online lessons.	6.90%	8.62%	14.66%	39.22%	30.60%	3.78	75.6%

The institution has invested in softwares that allow online video lessons such as google meet and zoom meeting.	8.19%	14.66%	14.66%	33.19%	29.31%	3.61	72.2%
The institution has invested in the use of interactive white boards for conducting physical lessons in classrooms.	5.17%	10.78%	15.09%	40.52%	28.45%	3.76	75.2%
The institution has invested in training of trainers in using the teaching equipment's such as interactive white boards and flipped classrooms.	9.48%	12.93%	17.67%	31.47%	28.45%	3.56	71.2%

The institution has invested in e-library, e-journals, e-books.	9.48%	13.36%	18.10%	34.48%	24.57%	3.51	70.2%

Key: SD-Strongly Disagree, D-Disagree, MA-Moderately Agree, A-Agree, SA-Strongly Agree, x̄- Mean, PA- Percentage Average

The results from Table 4.8 indicated that 28.45%, 40.52% and 14.22% of the respondents strongly agreed, agreed and moderately agreed, respectively, with the statement that the institution invests heavily in e-learning systems. Meanwhile, 9.91% and 6.9% disagreed and strongly disagreed respectively. The average response percentage was 74.8%, implying that the majority of respondents (83.19%) agreed that the institution invests heavily in e-learning systems. This was supported by an interviewee who had the following to say in this regard;

> ……. Our institution places a significant emphasis on investing in e-learning systems, recognizing the transformative potential they have in modern education. These investments align with our commitment to delivering high-quality education and ensuring that our students have access to the best possible learning resources and opportunities…. *Principal participant*

The results also found that 31.47%, 32.33% and 16.81% of the respondents strongly agreed, agreed and moderately agreed with the statement that the institution has invested in training staff who operate the e-learning systems. Conversely, 12.07% disagreed and 7.33% strongly disagreed. This implies that the majority of respondents (80.61%) agreed that the institution has invested in training staff who operate the e-

learning systems. This was confirmed by the average response percentage rate of 73.8%. This was supported by an interviewee who had the following to say;

> … Our institution appreciates the paramount importance of equipping our staff with the necessary skills and knowledge to effectively operate the e-learning systems. We have made deliberate investments in comprehensive training programs for our staff members who are responsible for managing and maintaining these systems…. *Principal participant*

Moreover, the findings regarding whether the institution has invested in computer hardware used by e-learners revealed that 31.03% of the respondents strongly agreed, 40.52% agreed and 15.95% moderately agreed. Additionally, 8.62% and 3.88% disagreed and strongly disagreed respectively. This suggests that most of the respondents (87.5%) agreed that the institution has invested in computer hardware used by e-learners. This was also confirmed by the average response percentage of 77.2%. This was supported by an interviewee who put the following;

> …Significant investments have been made in providing high-quality computer hardware to support our e-learners. We recognize that access to reliable and up-to-date technology is fundamental for a successful e-learning experience…… *Principal participant*

These findings are also in line with those of Raiham and Shanim (2011), which showed that web-based or online instruction in the TVET system in Bangladesh is advancing rapidly, while in Korean TVET institutions, e-Learning is extensively used. The study by Oyeronke and Fagbohun (2013) also indicated that the majority of teachers in Nigeria have undergone some level of training and are interested in ICT training. However, when it comes to the integration of ICT in teaching and learning, this is

limited to word processing and PowerPoint presentations.

Furthermore, findings indicating whether the institutions have invested in software that enables trainers to easily prepare their schemes of work and lesson plans showed that 30.6% strongly agreed, 34.05% agreed, 16.81% moderately agreed, 10.78% disagreed and 7.76% strongly disagreed. The average response percentage rate was 73.8%, meaning that most of the respondents (81.46%) agreed that institutions have invested in softwarethat enables trainers to easily prepare their schemes of work and lesson plans. This was supported by an interviewee who responded as follows;

> ……..Our investment in such software is motivated by our commitment to continuous improvement in the quality of education we provide. These tools empower our trainers to focus on the art of teaching and student engagement, while the software takes care of the administrative and organizational aspects. We believe that well-structured schemes of work and lesson plans are fundamental to a successful learning experience and our investment in these software tools supports that goal. ……. *Principal participant*

The results also found that 30.6%, 39.22% and 14.66% of the respondents strongly agreed, agreed and moderately agreed respectively with the statement that the institutions have invested in training of trainers on the presentation of online lessons. Conversely, 8.62% and 6.90% of the respondents disagreed and strongly disagreed respectively. The average response percentage was 75.6%, implying that the majority of the respondents (84.48%) agreed that the institutions have invested in the training of trainers on the presentation of online lessons. This was supported by an interviewee who responded as follows;

> ……. Our investment in the training of trainers for online lesson presentations is an indication of our commitment to delivering high-quality education in the digital age. We believe that well-prepared trainers are essential for effective online learning experiences for our students. As the educational landscape continues to evolve, we are dedicated to adapting and improving our training programs to meet the changing needs of both trainers and students. …….. *Principal participant*

On the other hand, 29.31%, 33.19% and 14.66% of the respondents strongly agreed, agreed and moderately agreed, respectively, with the statement that the institutions have invested in software that allows online video lessons such as Google Meet and Zoom meetings. Meanwhile, 14.66% disagreed and 8.19% strongly disagreed. This reveals that the majority of the respondents (77.16%) agreed that the institutions have invested in software that allows online video lessons such as Google Meet and Zoom meetings. This results in an average response percentage of 72.2%. This was supported by an interviewee who said the following ;

> …..Our institution recognizes the critical role that online video conferencing software plays in facilitating virtual classrooms and online learning. We've made a deliberate investment in tools like Google Meet and Zoom to provide a seamless and interactive learning experience for our students. …….. *Principal participant*

These findings were also supported by Hooker et al. (2011) study, which stated that ICT should facilitate virtual learning environments as well as develop learners' 21st-century skills. This involves access to ICT facilities, which entails the efficient integration of new tools and methodologies in curriculum instruction. In contrast, the study by Pradhan et al. (2020) showed that exercise software, online tests, data logging

tools and computer simulations were rarely used during lessons and teachers are slowto abandon traditional methods of classroom instruction.

The results regarding whether the institutions have invested in interactive whiteboards for conducting physical lessons in classrooms also indicated that 28.45% of the respondents strongly agreed, 40.52% agreed, 15.09% moderately agreed, 10.78% disagreed and 5.17% strongly disagreed. The average response percentage was 75.2%, meaning that the majority of the respondents (84.06%) agreed that the institutions have invested in the use of interactive whiteboards for conducting physical lessons in classrooms. This was supported by an interviewee who explained as follows;

> Our investment in interactive whiteboards aligns with our institution's commitment to providing a high-quality and interactive learning environment. This technology enriches classroom experiences, fosters active learning and equips our students with the skills needed for the digital age. We continuously assess its effectiveness and gather feedback from both trainers and students to make improvements and adjustments as necessary, ensuring that the benefits of this investment are maximized……. *Principal participant*

Additionally, 28.45%, 31.47% and 17.67% of the respondents strongly agreed, agreed and moderately agreed with the statement that the institutions have invested in the training of trainers in using teaching equipment such as interactive whiteboards and flipped classrooms. Conversely, 12.93% and 9.48% disagreed and strongly disagreed respectively. These results in an average response percentage of 71.2%, which implies that the majority of the respondents (77.59%) agreed that the institutions have invested

in the training of trainers in using teaching equipment such as interactive whiteboards and flipped classrooms. This was supported by an interviewee who had the following to say;

> Institution places a strong emphasis on ensuring that our educators are proficient in utilizing teaching equipment and innovative teaching methodologies to provide the best possible educational experiences for our students. ……. *Principal participant*

The findings s indicating whether the institutions have invested in e-library, e-journals and e-books also indicated that 24.57% of the respondents strongly agreed, 34.48% agreed, 18.10% moderately agreed, 13.36% disagreed and 9.48% strongly disagreed. The average response percentage was 70.2%, meaning that the majority of the respondents (77.15%) agreed that the institutions have invested in e-library, e-journals and e-books. This was supported by an interviewee who had the following to say;

> ……Our investment in e-library resources reflects our commitment to providing students with the best possible educational materials and research tools. It empowers them to become independent and lifelong learners, capable of critical thinking and rigorous academic inquiry. As the academic landscape evolves, we continue to assess the effectiveness of these resources and gather feedback from our students to ensure that they meet their evolving needs.……. *Principal participant*

Similarly, the survey by UNESCO (2014) outlined that Caribbean countries (particularly Anglophone ones) had higher levels of integration of ICT- assisted instruction, especially ICT infrastructure, including hardware and internet connectivity, compared to most Latin American countries. Engida (2011) study also indicated that countries like Uruguay with strong ICT policies had higher levels of integration. There

is a need to determine whether a strong ICT policy is commensurate with high levels of ICT integration in teaching and learning in TVET institutions.

Moreover, the principals and bursars who were interviewed were also requested to give their opinion with regards to Instructional processes;

Six (60%) of the principals said that the KNEC guidelines and other curriculum policies put inplace to ensure effective use of essential software's in teaching and learning in classrooms are still inadequate. Still,41% of the principals agreed that there is an increase in the supply and use of essential software's in teaching and learning in their institutions. Eight (80%) of the bursars noted that the budgeted amount for the e-learning systems, lesson preparation software's and teaching equipment is approximately 15 % of the total institutional budget.

Eight (80%) of the principals agreed that the use of the e-learning systems allows them to reach a wider audience, engage with students remotely and offer flexible learning options. Whereas, seven (70%) of the bursars confirmed that the financial resources allocated to implement e-learning systems were effectively utilized and the system has also been found to be cost-effective in reducing the need for physical infrastructure and printed materials.

Nine (90%) of the principals concur that e-learning and online video lessons has propelled a blended learning approach to their students. Seven (70%) of the bursars highlighted that the allocated resources are more invested in advancement and proper maintenance of the e-learning systems.

4.7.1 Results of the Test of Hypothesis on the Level of Integration of ICT in Instructional Processes

The hypothesis was tested at a 5% significance level and the rejection/acceptance decision was determined by p- values of the study against 0.05 level of significance. The third null hypothesis stated that;

$H0_3$: There is no statistically significant difference between ICT integration in Instructional Processes in TTIs in Nyeri and Nairobi Counties in Kenya.

The mean percentage with respect to the level of ICT integration in instructional processes indicate that TTIs in Nyeri County had 42.98% while TTIs in Nairobi County had 57.14% as depicted in Figure 4.10 below.

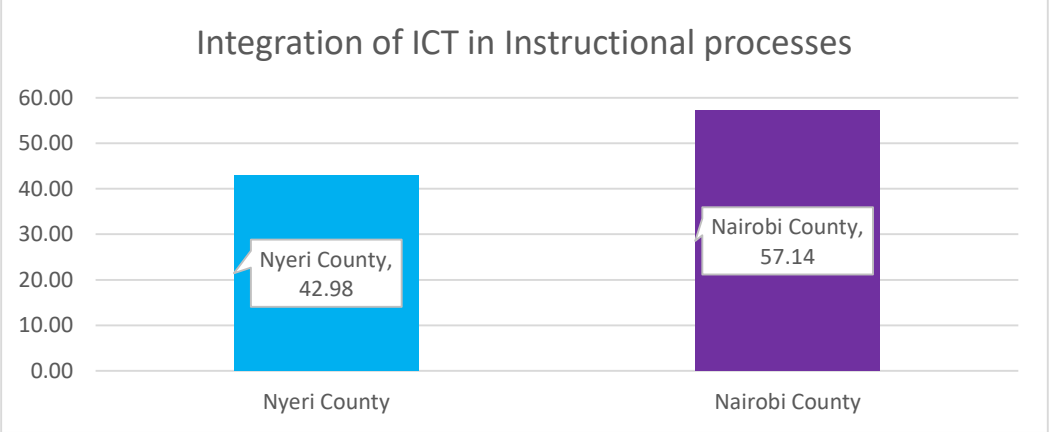

Figure 4.10: Level of Integration of ICT in Instructional Processes in TTIs in Nyeri and Nairobi Counties

To determine whether there existed a statistically significant difference in the level of ICT integration in instructional processes between TTIs in Nyeri and Nairobi Counties, a t-test was conducted and the results are presented in Table 4.9 below.

Table 4.9: T-test Analysis for ICT Integration in Instructional Processes

Variables	Counties	Percent %	Mean	T-statistic	P-value
Av_instructional processes	Nyeri	42.98	2.552867	0.085745	0.000
	Nairobi	57.14	3.394033	0.10728	
	Total		5.94	0.073049	

According to the results presented in table 4.9 above, there was a statistically significant difference (t=0.073, p=0.000) in the level of ICT integration in Instructional Processes between TTIs in Nyeri and Nairobi Counties. The statistical difference in integration of ICT in instructional processes can be accounted for by the fact of digital divide. This suggests that there is a likelihood that trainers in TTIs within urban areas have better access to technology and opportunities to learn and interact with ICT. This leads to higher integration of ICT in the urban placed TTIs. These results are also supported by the findings of the UNESCO (2014) study, which revealed that Caribbean nations, especially thosewith English as the predominant language, exhibited greater levels of ICT-integrated instruction.

This integration encompassed not only hardware but also internet connectivity, setting them apart from numerous Latin American countries. Notably, countries like Cuba and the Dominican Republic displayed limited progress in terms of integration. This observation underscores the notion that developed nations tend to achieve more substantial integration of ICT compared to their developing counterparts. However, these findings differed with those of Kiplimo (2018) study which highlighted that majority of trainers of Electrical Engineering in TTIs in Nairobi County complained of low ICT integration in terms of classroom internet connectivity, computer hardware and software in their technical labs. This implied that the level of ICT integration differs

depending on the kind of department in TTIs even though TTIs in Nairobi County are at a better position to access modern technology.

4.8 ICT Integration in Assessment Practices

The fourth objective of the study was to establish the level of ICT integration in assessment practices in Technical Training Institutes (TTIs) in Nyeri and Nairobi Counties in Kenya. Table 4.10 presents the findings.

Table 4.10: The Level of ICT integration in Assessment Practices

Statements	SD	D	MA	A	SA	$\bar{x}$	PA
The institution has invested in modules used in administering online exams.	3.45%	7.76%	15.95%	42.24%	30.60%	3.89	77.8%
The institution has invested in training staff on how to use online exam modules.	6.47%	10.78%	15.09%	37.07%	30.60%	3.75	75%
The institution has put in place policies on how online	2.16%	7.76%	15.95%	42.67%	31.47%	3.94	78.8%

exams are supposed to be administered.							
The institution has invested in modules used in administering online assignments	6.90%	11.21%	16.81%	36.21%	28.88%	3.69	73.8%
The institution has invested in training staff on how to use online assignment modules.	3.88%	6.90%	16.38%	43.53%	29.31%	3.88	77.6%
The institution has put in place policies on how online assignment are supposed to be administered.	6.03%	9.48%	16.38%	37.07%	31.03%	3.78	75.6%
The institution has invested in modules used in	3.02%	6.03%	15.95%	43.53%	31.47%	3.94	78.8%

administering online discussion groups and presentations.							
The institution has invested in training staff on how to use online discussion group and presentation modules.	5.17%	10.34%	14.22%	39.66%	30.60%	3.8	76%
The institution has put in place policies on how online discussion groups and presentations are supposed to be administered.	7.76%	10.78%	19.40%	34.05%	28.02%	3.64	72.8%

Key: SD-Strongly Disagree, D-Disagree, MA-Moderately Agree, A-Agree, SA-Strongly Agree, x̄- Mean, PA- Percentage Average

The results from Table 4.10 indicate that 30.60% strongly agreed, 42.24% agreed and 15.95% moderately agreed with the statement that the institutions have invested in

modules used for administering online exams. Meanwhile, 7.76% disagreed and 3.45% strongly disagreed. This implies that the majority of respondents (88.79%) agreed that the institutions have invested in modules for administering online exams, resulting in an average response percentage of 77.8%. This was supported by an interviewee who responded as follows;

> ……The institution has recognized the importance of modernizing our assessment methods and providing a secure and convenient online examination environment for our students. To achieve this, we have made strategic investments in modules designed specifically for administering online exams.……. *Principal participant*

Moreover, the results regarding whether the institutions have invested in training staff on how to use online exam modules show that 30.60% of the respondents strongly agreed, 37.07% agreed, 15.09% moderately agreed, 10.78% disagreed and 6.47% strongly disagreed. The average percentage of the responses was 75%, revealing that the majority of respondents (82.76%) agreed that the institutions have invested in training staff on how to use online exam modules. This was supported by an interviewee who had the following to say;

> …… The institution investment in staff training to use online exam modules reflects our commitment to delivering high-quality education and assessment. Well-prepared staff members are essential for creating assessments that are fair, secure and aligned with our educational goals. As the educational landscape evolves, we are dedicated to adapting and enhancing our training programs to meet the changing needs of our staff and students...……. *Principal participant*

The results also found that 31.47%, 42.67% and 15.95% of the respondents strongly

agreed, agreed and moderately agreed, respectively, with the statement that the institutions have put in place policies on how online exams are supposed to be administered. In contrast, 7.76% and 2.16% disagreed and strongly disagreed, respectively. The average percentage of the responses was 78.8%, implying that the majority of respondents (90.09%) agreed that the institutions have put in place policies on how online exams are supposed to be administered. This was supported by an interviewee who explained as follows;

> …… Our policies on the administration of online exams are designed to create a standardized and secure assessment environment that ensures academic integrity. They provide a framework for educators, students and administrators to follow, fostering transparency and fairness in our assessment processes. Additionally, these policies serve to protect the rights and interests of both students and the institution……. *Principal participant*

Similarly, the findings of Hopfenbeck (2018) study can relate to these findings, as they emphasize an examination of the techniques employed by teachers and the formative strategies integrated in systematic approaches such as mastery learning, online examination tests and student views. However, Saglam's (2018) study disagreed with these findings, noting that evaluating the finished ICT output using a writing approach will only provide teachers with partial and frequently restricted evidence of a child's ICT capability.

Furthermore, the findings indicated that 28.88%, 36.21% and 16.81% of the respondents strongly agreed, agreed and moderately agreed, respectively, with the statement that the institutions have invested in modules used for administering online assignments. On the other hand, 11.21% of the respondents disagreed and 6.90%

strongly disagreed. The average percentage of the responses was 73.8%, indicating that the majority of respondents (81.90%) agreed that the institutions have invested in modules used for administering online assignments. This was supported by an interviewee who explained as follows;

> …… Our investment in online assignment administration modules reflects our commitment to modernizing the assignment submission and grading process, while ensuring transparency, efficiency and the highest standards of academic integrity. It allows us to adapt to the changing landscape of education and offer students a convenient and robust assignment experience. We continuously assess the effectiveness of these modules and gather feedback from educators and students to make improvements as needed ……. *Principal participant*

Additionally, 29.31%, 43.53% and 16.38% of the respondents strongly agreed, agreed and moderately agreed respectively, with the statement that the institutions have invested in training staff on how to use online assignment modules. In contrast, 6.90% and 3.88% disagreed and strongly disagreed, respectively. The average percentage of the responses was 77.6%, revealing that the majority of respondents (89.22%) agreed that the institutions have invested in training staff on how to use online assignment modules. This was supported by an interviewee who explained as follows;

> …… Institution recognizes the importance of equipping our staff with the necessary knowledge and skills to effectively use online assignment modules for assessment purposes. This investment aligns with our commitment to providing high-quality and efficient assessment methods……. *Principal participant*

The results indicating whether the institutions have put in place policies on how online

assignments are supposed to be administered also found that 31.03% of the respondents strongly agreed, 37.07% agreed, 16.38% moderately agreed, 9.48% disagreed and 6.03% strongly disagreed. The average percentage of the responses was 75.6%, implying that the majority of respondents (84.48%) agreed that the institutions have put in place policies on how online assignments are supposed to be administered. This was supported by an interviewee who had had the following in this regard;

> …… Our policies on the administration of online assignments serve to create a structured and equitable assessment environment that ensures academic integrity. They provide a framework for educators, students and administrators to follow, fostering transparency and fairness in our assessment processes. Additionally, these policies protect the rights and interests of both students and the institution ……. *Principal participant*

However, the study of Hartmeyer et al. (2018) is in disagreement with these findings, showing that most teachers in Sweden suggested the need for more guidance and information on how to carry out assessment practices, the opportunity to collaborate with others through networks and expanded use of the new strategy with more coworkers. Kihozaet al. (2016) study also indicated that teacher trainees in colleges in Tanzania had poor skills and inefficient support in the use of basic ICTs, including hardware, software and other peripherals. Therefore, the study recommended the implementation of training programs to educate teachers on effectively conducting assessment practices with their students.

The results also revealed that 31.47% of the respondents strongly agreed with the statement that the institutions have invested in modules used for administering online discussion groups and presentations, 43.53% agreed and 15.95% moderately agreed.

Additionally, 6.03% disagreed, while 3.02% strongly disagreed. The average percentage of responses was 78.8%, implying that the majority of respondents (90.95%) agreed that the institutions have invested in modules used for administering online discussion groups and presentations. This was supported by an interviewee who had the following to say;

> …… The institution places a strong emphasis on creating a dynamic and interactive learning environment that fosters collaboration, communication and engagement. To achieve this, we've made strategic investments in modules designed specifically for administering online discussion groups and presentations……. *Principal participant*

Furthermore, the results regarding whether the institutions have invested in training staff on how to use online discussion group and presentation modules showed that 30.60% of the respondents strongly agreed, 39.66% agreed, 14.22% moderately agreed, 10.34% disagreed and 5.17% strongly disagreed. The average percentage of the responses was 76%, implying that the majority of respondents (84.48%) agreed that the institutions have invested in training staff on how to use online discussion group and presentation modules. This was supported by an interviewee who had the following to say;

> …… Our investment in staff training to use online discussion group and presentation modules reflects our commitment to delivering high-quality education and fostering interactive learning environments. Well-prepared staff members are essential for creating engaging discussions, presentations and collaborative learning opportunities for our students……. *Principal participant*

The results also indicated that 28.02% of the respondents strongly agreed with the

statement that the institutions have put in place policies on how online discussion groups and presentations are supposed to be administered, 34.05% agreed, 19.40% moderately agreed, 10.78% disagreed and 7.76% strongly disagreed. The average percentage of responses was 72.8%, implying that the majority of respondents (81.47%) agreed that the institutions have put in place policies on how online discussion groups and presentations are supposed to be administered. This was supported by an interviewee who responded as follows;

> …… Our policies on the administration of online discussion groups and presentations serve to create a structured and engaging learning environment that ensures effective interaction and academic integrity. They provide a framework for educators, students and administrators to follow, fostering transparency and fairness in our engagement processes. Additionally, these policies protect the rights and interests of both students and the institution……. *Principal participant*

Aslan and Zhu (2018) study results also demonstrated that pre-service teacher training programs, particularly pedagogical knowledge and ICT-related courses, have a substantial influence on pre-service teachers' ability to employ ICT in their assessment practices. However, Oyeronke and Fagbohun (2013) study findings differed from the current findings, as they outlined that the integration of ICT in teaching and learning in Nigeria was limited to word processing and PowerPoint presentations.

Moreover, the principals and bursars who were interviewed were also requested to give their opinion with regard ICT integration in assessment practices;

> Eight (80%) of the principals agreed that there is an increase in use of ICT in curriculum instruction and training supervision but low ICT integration

in student's assessment. Seven (75%) of the bursars said that the budgeted amount for the e-learning systems, lesson preparation software's and teaching equipment is more than 10% of the total institutional budget.

Nine (90%) of the principals highlighted that they have received positive feedback from the trainers on how the online assessment tools assist in fast evaluation of students' performance and tracking their progress more efficiently. Eight (80%) of the bursars agreed that the use of online assessment practices provides instant feedback and grading, making assessment for the trainers more effective and timelier.

Eight (80%) of the principals also concurred that online assessment tools create diverse and secure assessments, including objective and subjective questions, making it easier to evaluate students' understanding of the material. Nine (90%) of the bursars agreed that online assessment tools have helped in reducing the administrative burden associated with paper-based exams.

4.8.1 Results of Test of Hypothesis on ICT Integration in Assessment Practices

The hypotheses were tested at a 5% significance level and the rejection/acceptance decision were determined by p values of the study against 0.05 level of significance. The fourth null hypothesis stated that;

$H0_4$: There is no statistically significant difference between ICT integration in Assessment Practices in TTIs in Nyeri and Nairobi Counties in Kenya.

The mean percentage with respect to the level of ICT integration in assessment practices revealed that TTIs in Nyeri County had 43% while TTIs in Nairobi County had 57%.

as depicted in table Figure 4.11 below.

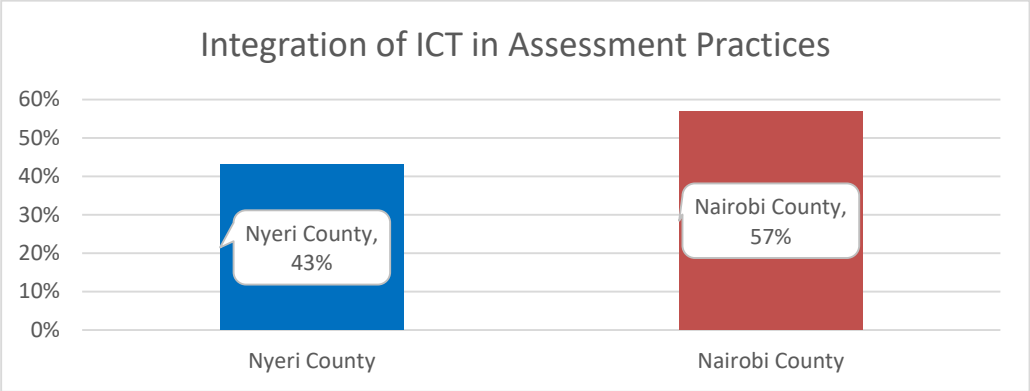

Figure 4.11: Level of Integration of ICT in Assessment Practices in TTIs in Nyeri and Nairobi Counties

To determine whether there existed a statistically significant difference in the level of ICT integration in assessment practices between TTIs in Nyeri and Nairobi Counties, a t- test was conducted and the results are presented in Table 4.11 below.

Table 4.11: T-test Analysis for ICT Integration in Assessment Practices

Variables	Counties	Percent %	Mean	T-statistic	P-value
Av_assessment practices	Nyeri	43%	2.577061	0.083217	0
	Nairobi	57%	3.408436	0.108404	
	Total		5.99	0.072452	

According to the results presented in Table 4.11 above, there was a statistically significant difference (t=0.073, p=0.000) in the level of ICT integration in assessment practices between TTIs in Nyeri and Nairobi County. Thus, the null hypothesis was rejected. This implies that the level of ICT integration in assessment processes is lower in TTIs in Nyeri county than in TTIs in Nairobi County. This observation could be

linked to challenges in internet connectivity in rural areas more than urban areas and requisite technical equipment.

Yu et al (2023) posit that urban teachers are better equipped to fully integrate digital technologies into education, which indicate that rural teachers were facing the problem of integration of digital technology in teaching. This implies that the trainers in TTIs in urban set up do apply ICT in assessment practices more than the rural area trainers. The Nairobi County TTIs trainers are better equipped to fully integrate technology in education and further in assessment practices more than their counterparts in Nyeri.

Aslan and Zhu (2018) study results also demonstrated that pre-service teacher training programs, particularly pedagogical knowledge and ICT-related courses, have a substantial influence on pre-service teachers' ability to employ ICT in their assessment practices. However, these findings differed with those of Oyeronke and Fagbohun (2013) since they outlined that integration of ICT in teaching and learning in Nigeria was limited to word processing and power point presentation. Additionally, Ndile (2018) study also found that youth employability in TTIs in Nairobi County was higher as compared to other counties due the increased exposure in digital skills and competencies needed in the job market.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND DISCUSSIONS

5.1 Introduction

This chapter presents the summary of the findings of the study in accordance with the stated objectives that guided the study. The conclusions and recommendations arising from the study are also outlined in this chapter. The study also proposes the areas for further research which were not adequately covered in this undertaking.

5.2 Summary of Findings

The study aimed to assess the level of ICT integration between TTIs in Nairobi and Nyeri Counties in Kenya. The level of ICT integration was particularly examined in administrative functions, financial management, instructional processes and assessment practices in TTIs in Nairobi and Nyeri counties in Kenya. The study employed a descriptive research design where quantitative research approaches were utilized. The target population comprised of 10 principals, 1006 lecturers and 10 bursars and using the sampling tables by Krejcie and Morgan (1970) the researcher obtained a sample size of 10 principals, 290 lecturers and 10 bursars.

Research data was then obtained by use of structured questionnaires and two interview guides. The structured questionnaires were administered to the 290 lecturers/ trainers and the interview guides were used to interview the principals and bursars of the selected TTIs in Nairobi and Nyeri counties. The researcher also carried out a pilot test to assess the validity and reliability of the research instruments and according to the findings all the variables had a Cronbach Alpha greater than 0.70 and KMO value that is greater than 0.5 meaning that the questions and statements on the questionnaires were valid and reliable to provide accurate data that the

researcher can draw findings, conclusion and recommendations. The summary of the findings is presented in accordance with the stated objectives as indicated herein.

5.2.1 ICT Integration in Administrative Functions

The findings of the study revealed that respondents in both Nyeri and Nairobi counties were in agreement with most of the statements concerning whether Technical Training Institutes (TTIs) had made substantial investments in ICT integration for administrative functions. This was particularly evident in ERP systems, ISMS systems and business telephone systems. Furthermore, respondents in both counties also concurred with most of the statements regarding whether TTIs had invested in training staff responsible for operating ERP systems, ISMS systems and business telephone systems. The percentage average of responses for all these statements exceeded 50%. Consequently, this suggests that a majority of the institutions have effectively integrated ICT into their administrative functions by investing in ERP systems, ISMS systems and business telephone systems.

The first null hypothesis stated that there is no statistical difference between the level of ICT integration in administrative functions in TTIs in Nyeri and Nairobi counties in Kenya. The mean percentage indicating the level of ICT integration in performing administrative functions showed that Nyeri recorded 41.91%, whereas Nairobi attained a score of 58.16%.The results of the t-test conducted indicated a statistical significant difference ($t = 0.077$, $p = 0.000$) in the level of ICT integration in administrative functions between TTIs in Nyeri and Nairobi Counties.

The null hypothesis was therefore rejected and the study adopted the alternative hypothesis which stated that there is a statistically significant difference between the level of integration of ICT in administrative functions in TTIs in Nyeri and Nairobi Counties. Thus, it can be concluded that ICT integration in Nairobi County was higher than in Nyeri County and this can

be attributed to the fact that TTIs in Nairobi County are more aware and exposed to new developments in ICT integration than TTIs in Nyeri county (Ogony, 2017). This is particularly in ERP systems, ISMS systems and business telephone systems used in the TVETs administration.

5.2.2 ICT Integration in Financial Management

The results of the study revealed that the respondents in both Nyeri and Nairobi counties agreed with most of the statements on whether the TTIs heavily invests in ICTintegration in financial management. This is especially in e-procurement systems, automated budgeting systems and accounting information systems (AIS). The respondents also agreed with most of the statements regarding whether TTIs have invested in training staff who operate in e-procurement systems, automated budgeting systems and AIS. This shows that TTIs have integrated ICT into financial functions.

The second null hypothesis postulated that there is no statistically significant difference in the level of ICT integration in financial management between Technical Training Institutes (TTIs) in Nyeri and Nairobi counties, Kenya. The mean percentages concerning the level of ICT integration in financial management indicated that TTIs in Nyeri County scored 42%, while TTIs in Nairobi County scored 58%. The results of the t-test conducted revealed a significant difference ($t = 0.072$, $p = 0.000$) in the level of ICT integration in financial management between TTIs in Nyeri and Nairobi counties. Consequently, the null hypothesis was rejected and it was concluded that there is a statistically significant difference in the level of ICT integration in financial management between TTIs in Nyeri and Nairobi counties.

The level of ICT integration in Nairobi County exceeded that of Nyeri County, likely due to TTIs in Nairobi County having more robust ICT platforms that facilitate effective financial reporting

systems, ensuring accountability and transparency throughout the accounting cycle, in comparison to TTIs in Nyeri County (Njenga, 2013). This, in turn, has led to more efficient budget allocation, resource utilization and improved overall financial performance in TTIs in Nairobi County.

5.5.3 ICT Integration in Instructional Processes

The majority of the respondents in both Nyeri and Nairobi counties agreed that TTIs heavily invest in ICT integration in instructional processes. These include e-learning systems, software and equipment for course content preparation by trainers, online presentation software such as Google Meet and Zoom and an e-library. The respondents also agreed with most of the statements on whether the TTIs have invested intraining staff who operate e-learning systems, software and equipment for course content preparation by trainers, online presentation software such as Google Meet, Zoom and e-library. This was demonstrated by the percentage average of the responses, which was more than 50% in all the statements. As a result, it can be concluded that TTIs have integrated ICT into instruction processes to a large extent, as shown by the high level of agreement from respondents.

The third null hypothesis postulated that there is no statistically significant difference in ICT integration within instructional processes among Technical Training Institutes (TTIs) in Nyeri and Nairobi counties, Kenya. The mean percentages on level of ICT integration in instructional processes revealed that TTIs in Nyeri County scored 42.98%, whereas TTIs in Nairobi County scored 57.14%. The results of the t-test conducted indicated a statistically significant difference ($t = 0.073$, $p = 0.000$) in the level of ICT integration in instructional processes between TTIs in Nyeri and Nairobi counties.

Consequently, the null hypothesis was rejected. The study concluded that ICT integration in

Nairobi County exceeded that in Nyeri County, likely due to TTIs in Nairobi County having better access to ICT facilities that facilitate the efficient integration of new tools and methodologies into the curriculum and instructional practices.

5.2.4 ICT Integration in Assessment Practices

The results of the study indicated that the respondents in both Nyeri and Nairobi counties agreed with most of the statements on whether the TTIs heavily invest in ICTintegration in assessment practices. These practices include modules for online examinations, modules for online assignments and modules for online discussions. The respondents also agreed with most of the statements regarding whether TTIs invest in training staff who operate on modules for online examinations, modules for online assignments and modules for online discussions. This was also confirmed by the percentage average of the responses, which was more than 50% in all the statements. Thus, it was inferred from the results that TTIs have integrated ICT into assessment practices to a large extent, as shown by the high level of agreement from respondents.

The fourth null hypothesis postulated that there is no statistically significant difference between ICT integration in Assessment Practices in TTIs in Nyeri and Nairobi Counties in Kenya. The mean percentages on the level of ICT integration in assessment practices disclosed that TTIs in Nyeri County attained a score of 43%, whereas TTIs in Nairobi County achieved 57%. The results of the t-test conducted revealed a statistical significant difference ($t=0.073$, $p=0.000$) in the level of ICT integration in assessment practices between TTIs in Nyeri and Nairobi Counties. As a result, the null hypothesis was rejected and the study adopted the alternative hypothesis, which posited that there exists a statistically significant difference in the level of ICT integration in assessment practices in TTIs between Nyeri and Nairobi Counties. This disparity can be attributed to the better access to ICT infrastructure in TTIs located in Nairobi County, enabling more meaningful ICT integration in assessment practices compared to TTIs in Nyeri County.

Furthermore, it may be due to trainers in Nyeri County lacking the necessary capacity to embrace ICT for pedagogical integration and assessment practices.

5.3 Conclusion

From the findings of the study, the following conclusions are made;

The study concluded that the level of ICT integration in administrative functions was higher for TTIs in Nairobi County than in Nyeri County thereby rejecting the first null hypothesis. Prevalence of Internet connectivity may account for the difference in integration. The study also concluded that the level of ICT integration in financial management forTTIs in Nairobi County was more than that of Nyeri County hence rejecting the null hypothesis. The study further concluded that there was a higher level of ICT integration in instructional processes for TTIs in Nairobi County than in Nyeri county and hence rejecting the null hypothesis. The study lastly concluded that there was a higher level of ICT integration in assessment practices in TTIs in Nairobi County than in Nyeri county and thereby rejecting the null hypotheses.

5.4 Recommendations

From the findings of the study, the following recommendations are made;

i. The findings of this study are elaborate on the level of ICT integration in managing TVETs. It's recommended for Scholars in the field of TVET, ICT and education management to utilize this study in various ways. They can use the results to validate and support findings from their own study. They may also base their work on the conceptual framework provided. In addition, they may apply the theoretical approaches outlined in this study.

ii. The findings of this study on levels of ICT integration in TVETs can help shape educational policies. Therefore, the study recommends that the policy makers in the ministry of

education and government bodies concerned with investment in ICT and education find it as a baseline for making ICT integration friendly policies that would encourage investment in ICT Integration. For instance, through recommendation of tax waivers on ICT equipment for learning institutions. Also, for more government budget to go into ICT investment to foster ICT integration in institutions. There is also need for government to make it compulsory through the ICT policy for all institutions to integrate ICT in all their operations in order to promote effectiveness and efficiency in governance and teaching and learning process. Further, the government could strengthen the ICT policy in order to enhance resource allocation by the ministry and respective institutions required to deepen integration of ICT in TVETs in Kenya.

iii. This study established that ICT percentage levels of integration in aspects of management in TVETs is below 60%. Therefore, it recommends the need for Principals and board members to cultivate a culture of investing in ICT by setting aside more resources to enhance ICT integration in administrative functions, financial management, instructional management and assessment management. This will enhance students learning as well as better pedagogical practices by TVETs trainers. Through the ICT policy, the government should have an annual performance target for every institution to file reports on their levels of ICT integration on all their operations.

5.5 Suggestions for Further Study

The study focused on the four stated objectives. However, the following areas were not exhaustively investigated and needs further research;

i. World over, ICT has become the driving force for economic and educational reforms. This has made it possible for TVET principals, staff, students and parents to exchange information and ideas with ease and instantly. There is therefore need for a further study

on the impact of ICT integration on; Financial management, administrative processes, instructional processes and assessment practices of TVETs. This will disclose the gains made so far through ICT integration.

ii. Integration of ICT is a global concern. There is need to undertake a comparative study on the ICT integration between the public and private technical institutions in Kenya. This will determine whether the private colleges are in the same pace of ICT integration as the public TVETs.

iii. This study covered two counties in Kenya out of the 47 counties. There is need to broaden the scope of the study of the ICT integration in TVETs to cover all the TTIs in the 47 counties in Kenya. Additionally, the study should also involve students and other non-teaching staff in TVETs so as to ascertain their perception about ICT integration in teaching, learning and managing TVETs.

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APPENDIXES

Appendix I: Sample Size Determination

N = Population Size, S = Recommended Sample Size

N	S	N	S	N	S
10	10	220	140	1 200	291
15	14	230	144	1 300	297
20	19	240	148	1 400	302
25	24	250	152	1 500	306
30	28	260	155	1 600	310
35	32	270	159	1 700	313
40	36	280	162	1 800	317
45	40	290	165	1 900	320
50	44	300	169	2 000	322
55	48	320	175	2 200	327
60	52	340	181	2 400	331
65	56	360	186	2 600	335
70	59	380	191	2 800	338
75	63	400	196	3 000	341
80	66	420	201	3 500	346
85	70	440	205	4 000	351
90	73	460	210	4 500	354
95	76	480	214	5 000	357
100	80	500	217	6 000	361

110	86	550	226	7 000	364
120	92	600	234	8 000	367
130	97	650	242	9 000	368
140	103	700	248	10 000	370
150	108	750	254	15 000	375
160	113	800	260	20 000	377
170	118	850	265	30 000	379
180	123	900	269	40 000	380
190	127	950	274	50 000	381
200	132	1 000	278	75 000	382
210	136	1 100	285	1 000 000	384

Source: Krejcie & Morgan, 1970

Appendix II: The Letter of Introduction to Respondents

Dear Participant,

My name is R. M. Gatembu**,** a student at Karatina University pursuing a Doctor ofPhilosophy Degree in Education Administration. As part of the course requirements, I am conducting a research on "**Integration of Information Communication Technologies (ICT) in Managing Technical Training Institutions in Nyeri andNairobi Counties, Kenya".**

The findings of this research will contribute to new knowledge and new research-based evidence that will inform the government, TVETs and development agencies on the integration of ICT in TVET institutions.You have the freedom to choose whether to take part in this study or not. If you chooseto take part, all the information you give will be confidential and will only be used in writing the research thesis. The report will not disclose any names of the participants. Kindly complete the questionnaire as honestly as possible.

Yours Sincerely,

R. M. Gatembu.

Appendix III: Trainers Questionnaire

Dear Respondent,

Thank you very much for accepting to participate in this study and to give valuable timeto fill this questionnaire. This questionnaire seeks to collect data that will assist in assessment of the **"Integration of Information Communication Technology inManaging Technical Training Institutions in Nairobi and Nyeri Counties, Kenya.**Your honest and accurate responses to the questionnaire items will be of great help to the success of this study. Please do not write your name or that of the Technical Institution you train at and be assured of total confidentiality of the information provided. Kindly answer all the listed items.

Section A. Background Information

(Please tick (□)against your best choice provided)

1. Category of your TVET institution.

National Polytechnic [ ]

Technical Training Institute [ ]

Special Needs Polytechnic [ ]

2. Gender.

Male [ ]

Female [ ]

Teaching experience in TVET institutions.

Less than 10years [ ]10 – 19 years [ ]

20 – 29 years [ ]

Above 30 years [ ]

What is your highest level of ICT training?

Degree [ ]

Diploma [ ]

Certificate [ ]Training workshop [ ]

No formal [ ]

Do you have a computer or laptop at home?

Yes [ ]

No [ ]

Can integration of ICT help to address issues in training and administrativework in the institution? Yes ( ) No ( )

How often do you use ICT in conducting work related functions ?

On daily basis [ ]

Twice a week [ ]

Once a month [ ]

Never [ ]

Section B: Integration of ICT in administrative functions for TTIs in Nyeri and Nairobi Counties in Kenya

This section has statements regarding integration of ICT in administrative functions. Kindly respond by marking the item that matches your opinion with a tick (√) or cross mark (x).

Integration of ICT in Administrative Functions						
1 Strongly Agree 2 Agree 3 Moderately Agree 4 Disagree 5 Strongly Disagree						
		1	**2**	**3**	**4**	**5**
1	The institution heavily invests in Enterprise Resource Processing systems (ERP).					
2	The institution has invested in training staff who operate ERP systems.					
3	The institution has invested in hardware used to run ERP systems.					
4	The institution heavily invests in Information Security Management Systems (ISMS).					
5	The institution has invested in training staff who operate the ISMS.					
6	The institution has invested in hardware used to run the ISMS.					
7	The institution heavily invests in business telephone systems					
8	The institution has invested in training staff who operate the business telephone systems.					
9	The institution has invested in hardware used to operate the business telephone systems.					

SECTION C: Integration of ICT in financial management for TTIs in Nyeri andNairobi Counties in Kenya

This section has statements regarding integration of ICT in financial management. Kindly respond by marking the item that matches your opinion with a tick (√) or crossmark (x).

Integration of ICT in Financial management						
1 Strongly Agree 2 Agree 3 Moderately Agree 4 Disagree 5 Strongly Disagree						
		1	**2**	**3**	**4**	**5**
1	The institution invests heavily e-procurement systems.					
2	The institution has invested in training of staff who operate the e-procurement systems.					
3	The institution has invested in hardware used to operate e-procurement systems.					
4	The institution invests heavily in automated budgeting systems.					
5	The institution has invested in training of staff who operate the automated budgeting systems.					
6	The institution has put in place policies for managing automated budgeting systems.					
7	The institution invests heavily in Accounting Information Systems (AIS).					
8	The institution has invested in training of staff who operate the AIS.					
9	The institution has invested in hardware used to operate the AIS.					

SECTION D: **Integration of ICT in Instructional Processes for TTIs in Nyeri andNairobi Counties in Kenya.**

This section has statements regarding integration of ICT in instructional processes .Kindly respond by marking the item that matches your opinion with a tick (√) or crossmark (x).

Integration of ICT in Instructional Processes						
1 Strongly Agree 2 Agree 3 Moderately Agree 4 Disagree 5 Strongly Disagree						
		1	**2**	**3**	**4**	**5**
1	The institution invests heavily in e- learning systems.					
2	The institution has invested in training staff who operate the e-learning systems.					
3	The institution has invested in computer hardware used by e-learners.					
4	The institution has invested in softwares that enable lecturers to easily prepare their schemes of work and lesson plans.					
5	The institution has invested in training of lecturers on presentation of online lessons.					
6	The institution has invested in softwares that allow online video lessons such as google meet and zoom meeting.					
7	The institution has invested in the use of interactive white boards for conducting physical lessons in classrooms.					
8	The institution has invested in training of lecturers in using the teaching equipment such as interactive white boards and flipped classrooms.					
9	The institution has invested in e-library, e-journals, e-books.					

SECTION E: Integration of ICT in assessment practices for TTIs in Nyeri and Nairobi Counties in Kenya

This section has statements regarding integration of ICT in assessment practices. Kindly respond by marking the item that matches your opinion with a tick (√) or crossmark (x).

Integration of ICT in Assessment Practices						
1 Strongly Agree 2 Agree 3 Moderately Agree 4 Disagree 5 Strongly Disagree						
		1	**2**	**3**	**4**	**5**
1	The institution has invested in modules used in administering online exams.					
2	The institution has invested in training staff on how to use online exam modules.					
3	The institution has put in place policies on how online exams are supposed to be administered.					
4	The institution has invested in modules used in administering online assignments					
5	The institution has invested in training staff on how to use online assignment modules.					
6	The institution has put in place policies on how online assignment are supposed to be administered.					
7	The institution has invested in modules used in administering online discussion groups and presentations.					
8	The institution has invested in training staff on how to use online discussion group and presentation modules.					

9	The institution has put in place policies on how online discussion groups and presentations are supposed to beadministered.					

Appendix IV: The Letter of Introduction to Respondents

Dear Participant,

My name is R. M. Gatembu**,** a student at Karatina University pursuing a Doctor of Philosophy Degree in Education Administration. As part of the course requirements, I'm conducting a research on "**Integration of Information Communication Technologies (ICT) in Managing Technical Training Institutions in Nyeri and Nairobi Counties, Kenya".** The findings of this research will contribute to new knowledge and new research-based evidence that will inform the government, TVET institutions and development agencies on the integration of ICT in TVET institutions. You have the freedom to choose whether to take part in this study or not. If you chooseto take part, all the information you give will be confidential and will only be used in writing the research thesis. The report will not disclose any names of the participants.

Kindly complete the questionnaire as honestly as possible.Yours Sincerely,

R. M. Gatembu.

Appendix V: Interview Guide for The Finance Officer /Bursar

Introduction

Thank you very much for accepting to participate in this study and to give valuable time to participate in this interview. The interview seeks to collect data that will assist in assessment of **Integration Information Communication Technologies (ICT) in Managing Technical Training Institutions in Nyeri and Nairobi Counties, Kenya".** Your honest and accurate responses to the interview will be of great help to the success of this study. Be assured of total confidentiality of the information provided.

1. In your opinion to what extent has the institution integrated ICT in administrative tasks? Explain.

……

2. Approximately what percentage of funds has been allocated for the;

   ERP …….

   ISMS……

   Business Telephone System……..

3. In your opinion has the integration of ICT in administrative tasks influenced the management of your institution? Explain.

…….

4. In your opinion to what extent has the institution integrated ICT in financial management? Explain.

   ……

5. Approximately what percentage of funds has been allocated for the;

E-procurement systems……

Automated budget systems……..

Accounting Information Systems……

6. In your opinion has the integration of ICT in financial management influenced the management of your institution? Explain.

   ……

7. In your opinion to what extent has the institution integrated ICT in instructional processes? Explain.

   ……

8. Approximately what percentage of funds has been allocated for the;

   E-learning systems……..

   Lesson preparation softwares…….

   Teaching equipments……

9. In your opinion has the integration of ICT in instructional processes influenced the management of your institution? Explain.

   ……

10. In your opinion to what extent has the institution integrated ICT in assessment practices? Explain.

    ……

    …….

11. Approximately what percentage of funds has been allocated for the;

    a. Modules for online exams…….
    b. Modules for online assignment……
    c. Modules for online discussion groups and presentation……

12. In your opinion has the integration of ICT in assessment practices influenced the management of your institution? Explain.

……

Appendix VI: Interview Schedule for Principals/Chief Principals/Senior Principals

Introduction

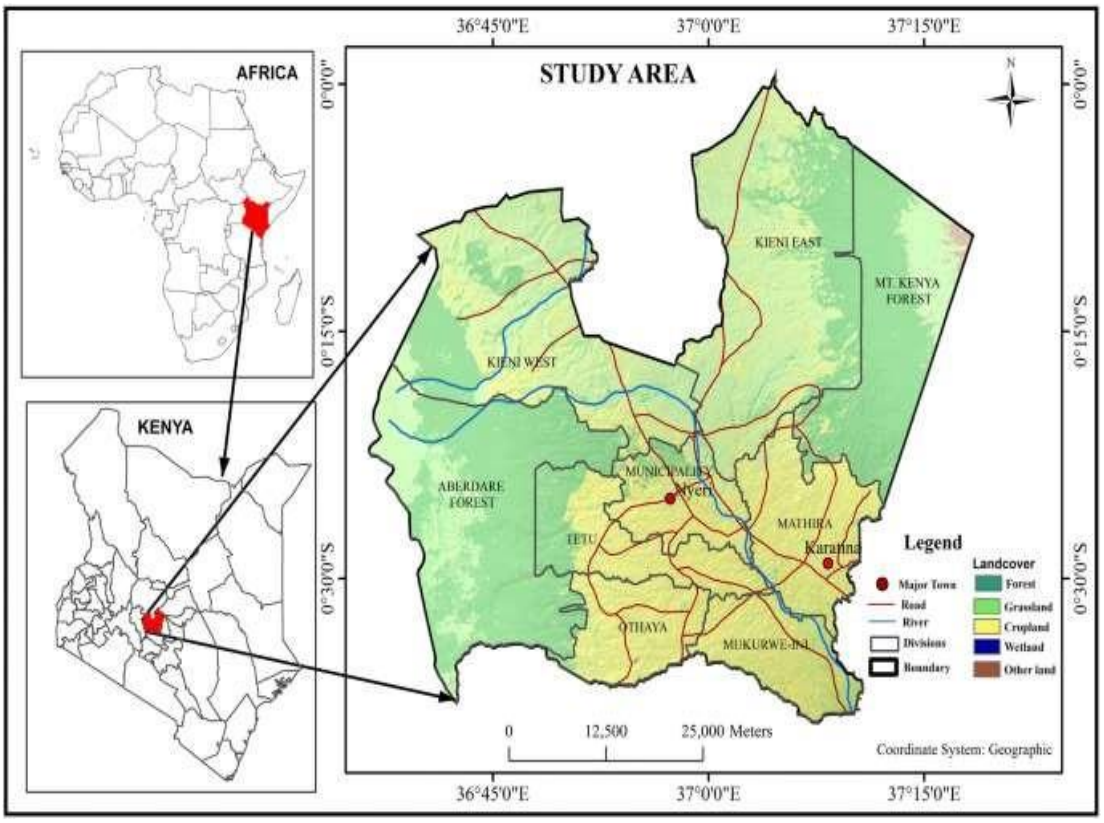
Thank you very much for accepting to participate in this study and to give valuable time to participate in this interview. The interview seeks to collect data that will assist in assessment of **Integration Information Communication Technologies (ICT) in Managing Technical Training Institutions in Nyeri and Nairobi Counties, Kenya".** Your honest and accurate responses to the interview will be of great help to the success of this study. Be assured of total confidentiality of the information provided.

1) How do your trainers view ICT integration in teaching and learning of trainees?
2) What programs have been put in place to help trainers meet the ICT requirements?
3) Has there been training workshops /seminars to train staff in essential softwares for teaching and learning in the classrooms?
4) In your own assessment do you think trainers are using ICT appropriately as a pedagogic tool?
5) Do you think ICT use is significant in curriculum implementation and evaluation?
6) With regard to the use of essential softwares in teaching and learning in classrooms, do you think the KNEC curriculum has put in place policies to ensure these softwares are effective?
7) To what extent is ICT use implemented in curriculum instruction, student's assessment and training supervision?

8) To what extent is ICT use implemented in financial management in yourInstitution?
9) What are some of the benefits that your institution has enjoyed as a result ofintegration of ICT in administrative tasks?
10) What are some of the benefits that your institution has enjoyed as a result ofintegration of ICT in instructional management?
11) Which strategies would you recommend that can enhance ICT integration in technical institutions in your county?

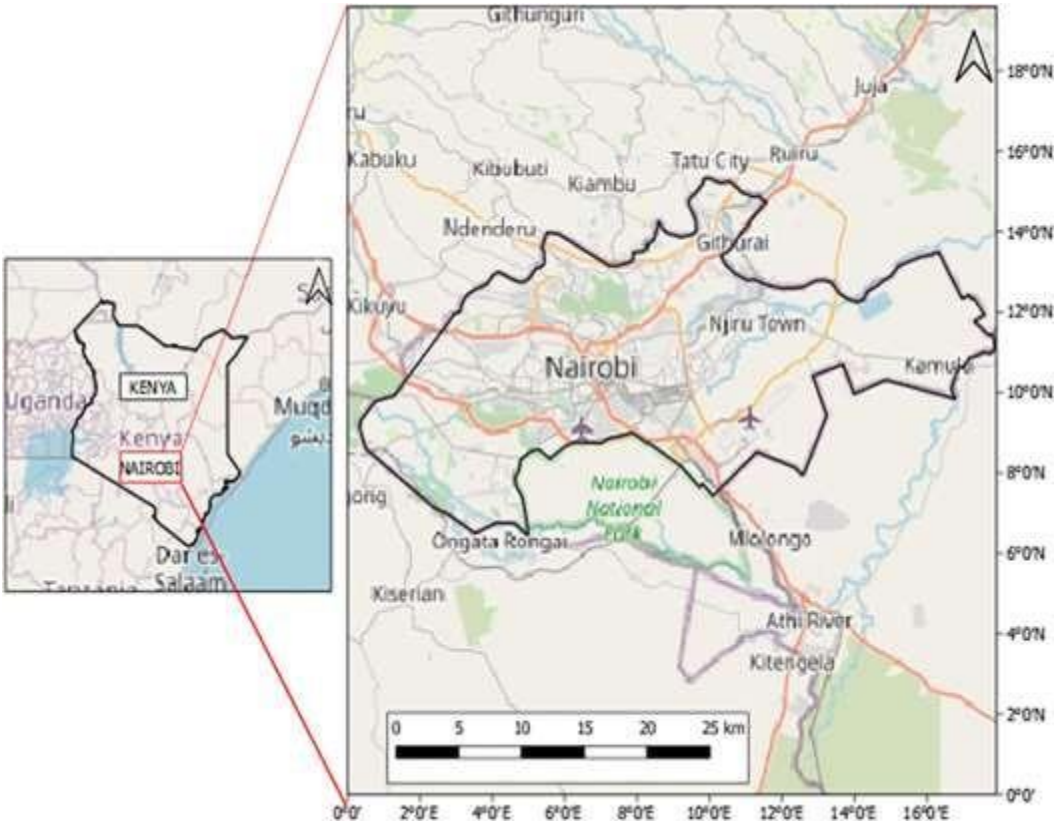
Appreciation for taking time for the interview

Appendix VII: Map of Nyeri County



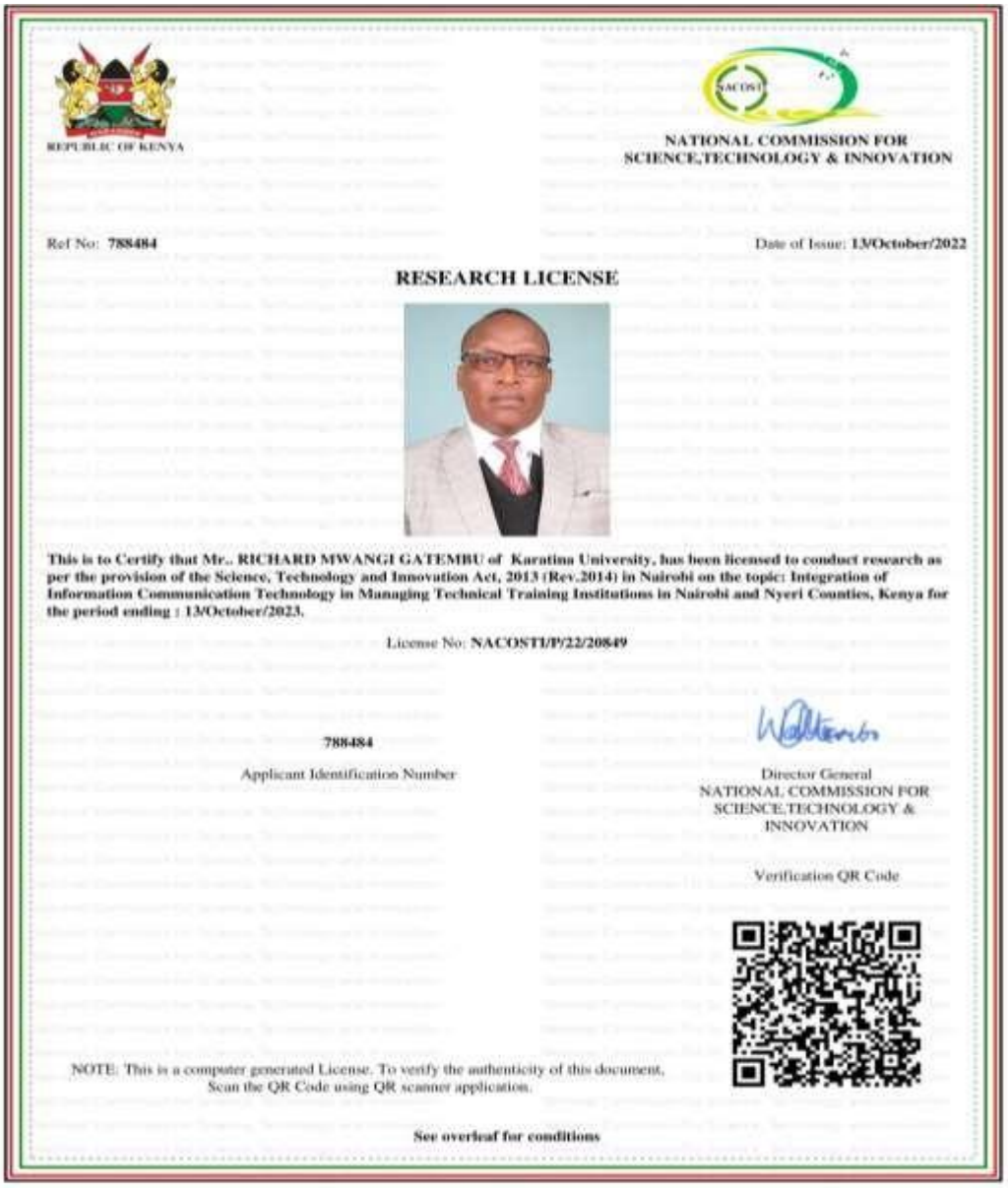
Source: Mwangi et al. 2020

Appendix VIII: Map of Nairobi County



Source: Olajubu et al. 2021

Appendix XI: NACOSTI Research Permit



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15. Relevant Institutional Scientific and Ethical Review Committee shall monitor and evaluate the research periodically, and make a report of its findings to the Commission for necessary action.

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