ICT IMPLEMENTATION FRAMEWORK FOR MANAGING EXPLICIT KNOWLEDGE IN SECONDARY SCHOOLS IN MERU CENTRAL SUBCOUNTY

HARRIET KARWITHA ARIMI

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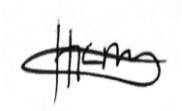
OCTOBER, 2022

DECLARATION AND RECOMMENDATION

DECLARATION

I declare this thesis is my original work that has never been presented in any other university for award of any degree.



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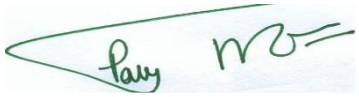

Sign: …… Date: ……26th October 2022……

Prof. Paul Gichohi (PhD)

Kenya Methodist University

Sign: …… Date: ……26th October 2022…….

Ms. Dorothy Bundi

Meru University

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DEDICATION

This thesis is dedicated to my loving husband, children and my entire family. Thank you for your support and good will.

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ABSTRACT

Kenya's vision 2030 acknowledges the centrality of the role of knowledge management systems in boosting international competitiveness, wealth creation and improving the general social welfare. However, ICT tools in knowledge creation, storage and sharing is not well articulated in Kenyan secondary schools. The purpose of this study was to examine ICT implementation framework for managing explicit knowledge in secondary schools in Meru Central Sub-county. The specific objectives were to assess the influence of ICT tools in knowledge creation, knowledge storage, knowledge sharing, and to develop an ICT framework for implementing explicit knowledge management in secondary schools. This study was anchored and guided by three theories which were: knowledge-based view theory, the Unified Theory of Acceptance and Use of Technology and the organization learning theory. Mixed methodology was used to collect data from 16 secondary schools. The schools were sampled using simple random sampling method to sample 30% of the 51 private and public secondary schools to obtain 16 sampled secondary schools. The study further used systematic proportionate sampling method to get equal proportions on the sampled secondary schools stratum. That is, boys, girls or mixed and day secondary schools to ensure good representation of schools. The 16 principals, 143 teachers, 16 school board chairpersons and 16 head prefects participated in the study. The teachers were sampled using proportional simple random sampling method.Interview, questionnaires and document analysis were used to collect data. Pre-testing was done in Nkuene girls' secondary school, Nkubu high school and Ntharene day secondary school in Imenti South Sub- County in Meru. Descriptive statistics such as percentages, frequencies and mean were used to analyze quantitive data while text analysis method was used to analyze qualitative data. The study also used system prototyping whereby an explicit knowledge management system was tested in a simple random sampled school in Meru County and put into use at Giaki secondary school for one month and the results were recorded. The study found out that e-learning was not yet fully operational in secondary schools in Meru central sub-county. There were still major set-backs like lack of proper technology and personal initiatives on technology usage by various users such as students and teachers. Therefore, the ministry of education should liaise with the ICT ministry to fasten the broadband connectivity project to secondary schools in Meru County. This will enable them have reliable internet. The principals and teachers should campaign on students' usage of social media to expand on knowledge sharing. The ministry of education should come up with specific guidelines to develop and customize frameworks in schools. Access to the materials provided in the developed ICT based knowledge management system prototype in this study would create more knowledge, share and store new knowledge for future users. This system further provided a multivalent platform for different departments to access and manage explicit knowledge. If this system is duplicated in various secondary schools, it would be beneficial for users to have a reliable system free from third parties' interference when managing explicit knowledge.

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ABBREVIATIONS AND ACRONYMS

ABM	Agent-Based Model
BOM	Board of Management
CAK	Communications Authority of Kenya
CEB	County Education Board
CoP	Communities of Practice
EBCP	Education Broadband Connectivity Project
EC	European Commission
EKM	Explicit Knowledge Management
ESF	Effective Schools Framework
HRM	Human Resource Management
ICT	Information and Communication Technology
IT	Information Technology
KBVT	Knowledge-based view theory
KEBS	Kenya Bureau of Standards
KM	Knowledge Management
KNEC	Kenya National Examinations Council
LAN	Local Area Network
MCG	Meru County Government
MoE	Ministry of Education
MF	Mastercard Foundation
OT	Organization theory
RBT	Resource-based theory
TDMP	Teacher Development and Management Policy

TEA	Texas Education Agency
TSC	Teachers' Service Commission
UNDESCO	United Nations Educational, Scientific and Cultural Organization
UTATUT	Unified Theory of Acceptance and Use of Technology

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Knowledge was defined as the ability to understand or become cognizant of somebody or something (Cumari, 2018). Once understanding was pertinent, a knowledgeable person was able to comprehend factual aspects in an area of concern and able to perform various skills in their everyday life. For a long-time, generations had been passing various knowledge to their offspring. Knowledge acquisition had not just been limited to human beings but as well as animals. For a living thing to survive in its niche, it acquired different levels of knowledge. Knowledge was widely sought after for both human beings and animals to get their meals, create a home, live in peace and conquer new territories (Chia-Nan & Huei-Huang, 2016). In this study a great concern is given on explicit knowledge. Explicit knowledge is any kind of knowledge that is easily articulated, written and stored in physical form so that it is accessible. Common examples of explicit knowledge are books and documents. Implicit knowledge is knowledge that is gained through incidental activities, or without awareness that learning is occurring. Some examples of implicit knowledge are knowing how to walk, run, ride a bicycle, or swim.

A book by Doren (1991) gave an account of where knowledge began. According to Doren (1991), knowledge was traced all the way from 50 centuries back when the human beings learnt more than their forefathers. The trend began from making of the first fire, making drawings out of natural paints to human civilization initiatives in Egypt, Mesopotamia, Rome, Greece and China (Doren, 1991). This was the period where people learnt farming, making iron tools and building. Since then, this information had been

passed from one generation to the other. However, this knowledge was improved from one generation to the other. For example, when people learnt blacksmith skill and were able to make various tools, some of these tools were used to farm hence replacing wooden farming tool which translated to improved productivity (Doren, 1991).

Knowledge was passed from one generation to the other through diverse ways. The ways through which a source decided to pass the knowledge depended on the people being addressed and the prompting reasons. For example, the old people were known for a long time to pass knowledge to children through stories and sharing various memories. However, when these same old people were talking to these children, they would do so through practically educating them such as showing them how to plant drought resistance food (Khuram, 2016). Apart from that, testimonies were given to future generations on the account of what transpired incase the source giving the information got a chance to see and experience the happenings.

In the 20th and 21st Century, things advanced and more inclinations given on scientific inquiry and technology (Khuram, 2016). Past experiences were more memorable and reliable when they were more scientifically proven by being subjected to thorough investigations beyond reasonable doubts. This was because, the traditional methods of passing knowledge were falling short in different areas. For example, when a source got a memory loss; when two accounts of different sources gave contradicting information; when a source decided to lie or overemphasize an account to look more knowledgeable; and when a source died without sharing information (Khuram, 2016; Massaro et al., 2016). These shortcomings caused an alteration of knowledge or simply not getting knowledge meant to be passed to the new generation. Human beings were concerned on

how knowledge was passed from one generation to the other as it was without prejudice or malice.

Various fields relied heavily on knowledge from older generations. For example, in law field, old knowledge enabled lawyers' base their arguments in a court. Once the judge heard these arguments, he or she referred to a ruling that had ever been made similar to the one at hand so as to portray fairness in their ruling. For example, according to Saprai (2017), the most relatable court case was the Balfour verses Balfour in 1919. This was a case that involved a husband who promised to give the wife thirty British pounds as monthly allowance. However, the husband did not keep his word prompting the wife to sue him to enforce the promise (Saprai, 2017). The case was dismissed on the account that the case was a domestic case in nature and there was no any contract signed by either party on the said issue. The knowledge portrayed by the Balfour verses the Balfour case was mostly used when handling domestic cases by judges (Saprai, 2017). A judge in the 21st Century hence needed a person from the 20th Century to pass that knowledge to them through various ways such as recording done in writings and in publications among other ways.

Turning our focus to the field of education such as in universities, scholars were able to come up with various writings such as projects, thesis and publication, all thanks to previous studies done before (Shahzad et al., 2016). The rule of the thumb entailed that one could not give solutions to a problem without showing who else had passed on knowledge in the research area of interest. Further on in medicine filed, doctors were able to advance their medicine knowledge further anchored on past true happening of accounts (Riaz & Hassan, 2019). A practical example could be the famous Spanish flu of 1918 (Wheelock, 2020). This flu was caused by H1N1 influenza virus which infected

around one third of the global population and many of them died (Wheelock, 2020). However, the then generation did not find a cure fast which led to the virus spreading in four different deadly waves but since this event was well recorded in various sources, knowledge was passed to the current 21st century generation (Wheelock, 2020).

When covid-19 pandemic struck the world in 2020, this generation was more prepared than the previous generation (Wheelock, 2020; Zhang et al., 2020). Some of the precautionary methods borrowed included wearing of masks and maintaining the social distance, not touching fluids of someone with flu like symptoms, and secluding any person who showed symptoms of covid-19 through quarantine method (Zhang et al., 2020). This knowledge slowed down the infection rates and motivated scientists to come up with solutions such as a vaccine as fast as possible hence less deadly as compared to the swine flu in 1918 (Wheelock, 2020).

This meant that when knowledge was able to be passed from one generation to the other, solutions were able to be established without delays since the new generation was not beginning from scratch (Wang et al., 2016). Therefore, the ability to maintain old knowledge in its original status so as to aid towards making decisions on new knowledge towards unfolding events warranted its management (Shujahat et al., 2018). Knowledge management was a very critical subject as far as passing knowledge from one generation to the other.

1.1.2 Overview of Knowledge Management Concept

Knowledge management was defined as the process through which knowledge was demarcated, organized, retained and shared to make improvements in an organization (Valaei et al., 2017). In this study, knowledge management was defined as the sentient

method of establishing, distributing, utilizing and maintaining knowledge to benefit a wider scope of recipients. This was because for knowledge management to take place, there must have been knowledge content which followed a process of distribution done by people who had reliable systems of maintaining the knowledge for future reference (Yasir et al., 2016). In addition, Knowledge was also managed through a multidisciplinary approach whereby organizations achieved their objectives by making maximum use of information and constant user feedbacks (Iqbal et al., 2018). The main goal of managing knowledge was to improve the quality of the contributions made by people and an increase in search interests of information in various authorized portals in the organization (Heisig et al., 2016). When an organization ventured in knowledge management, increased productivity, customer satisfaction was enhanced, improvement of income, faster solutions, employee growth and development, enhanced communication, faster decision-making process and creativity enhancement within an organization (Hodgins & Dadich, 2017).

There were two key types of knowledge management. These were explicit and tactical knowledge management (Mafabi et al., 2017). Explicit knowledge was known as the knowledge that could be easily articulated and codified. It could easily be stored and accessed like that found in documents. Tacit knowledge was knowledge, skills and abilities that one gained through experience (Mclver & Lepisto, 2017). In this study, explicit knowledge management was investigated because the main focus was a learning institution type of an organization (Massingham, 2018). In a learning institution, there was tendency to rely heavily on the type of knowledge gotten through on experience, skills and abilities. Explicit knowledge could be easily articulated, codified, stored and accessed. It could easily be transmitted to other forms like media videos and audios

(Mclver & Lepisto, 2017). In any learning organization, explicit knowledge was easily indicated through written documents, files, reports, manuals, videos and audios (Massingham, 2018).

Explicit knowledge was very easy to communicate and also to share as opposed to tacit knowledge (Mehralian et al., 2018). This was because it could be stored in data form and could easily be created and shared by use of ICT tools (Škerlavaj et al., 2018). IT played an important role in maintaining explicit knowledge. A learning organization could not be created alone by explicit knowledge. Explicit knowledge was known to interact with tacit knowledge like in the process of knowledge creation (Zhu et al., 2018). Explicit knowledge alone could not form a greater meaning at all. Even research documents were created by combination of explicit and tacit knowledge (Sahibzada et al., 2019). Some of the characteristics of explicit knowledge included being more formal, independence of the content, easily shared, reproducible and could be easily codified, transformed, documented, and also conveyed in a systematic way (Zhou et al., 2018).

Learning organizations got a competitive advantage when knowledge within the scope of its operations was effectively managed. Global organizations kept on striving towards ensuring knowledge was effectively managed and this had its share of short-comings. In America, organizations faced difficulties in coming up with practical relevance of knowledge to its current educational activities; unsatisfactory complement of knowledge management operations with dynamic Information Technology (IT); institutional cultural differences; new administrative structures costs; competition from other institutions; disinterest in users to contribute to the new knowledge; cyber-crimes; short-comings on ways of rewarding active users; outdated knowledge; unclarity on how

knowledge input was measured (Gürlek & Çemberci, 2020; Kianto et el., 2018; Masuin et al., 2019; Sahibzada et al.,2020).

In Europe, issues pertaining knowledge management included poor funding and support from the senior management in the institution; imbalance of people, systems and technology; low motivations of users to learn, sharing and contribution in knowledge management; unrealistic objectives on what knowledge management was set to achieve and its contribution in the vision of the institution; human related error costs; complicated process of accessing relevant information; low interaction of knowledge management users; communications barriers such as using lengthy and complicated grammar information; low computer skills to access information such as journals; discouraging integration of knowledge management to the current institution's systems (Amber et al., 2019; Bandera et al., 2017; Canonico et al., 2019; Cascio & Montealegre, 2016; Rusland et al., 2020).

In Asia, the challenges faced in knowledge management were inadequate resources to fully implement the knowledge management resources; unaccountability; knowledge management systems not being easily customized to fit unique needs of the institutions; overdependence on few users who contributed to the institution's knowledge; confusion in an institution operations as they tried to adopt to the new system; information misuse leading to cyber leakages to competitors; time wastage especially when users did not know how to use knowledge management systems; high costs associated with knowledge management systems; rapid change in Information and Commination Technology (ICT); and unfavorable government policies (Choi et al., 2016; Gonzalez & Melo, 2018; Kaba & Ramaiah, 2017; Li & Zhou, 2018; Little & Deokar, 2016; Manaf et al., 2018; Muthuveloo et al., 2017; Zhou et al., 2018).

In developing nations, knowledge management challenges facing organizations in South Africa were lack of training of the users on the new knowledge management systems; lack of funding; inadequate metric to measure the contribution made by knowledge management systems; lack of monitoring and evaluation of the systems; and lack of ICT infrastructure (Fombad & Onyancha, 2017; Gillman et al., 2020; Ngulube, 2017). In Western African nations such as Ghana and Nigeria, computer illiteracy levels among users led on the challenges' institutions experience when implementing knowledge management. In addition, poor government policies, high cases of cyber theft; lack of ICT infrastructure as well as low computer literacy; and lack of an integrated technique of linking between indigenous knowledge to current knowledge systems (Abbasi & Dastgeer, 2018; Aslani et al., 2016; Ogbonna, 2020). In Northern Africa, countries such as Morocco, Algeria and Tunisia, complains related to explicit knowledge included poor institutions' culture that resisted change; unavailable updated knowledge resources; discouraging knowledge sharing environment within the institution; and low reading culture. (Alvarenga et al., 2020; Hashmani & Ali, 2016; Pineda et al., 2020).

Coming to Eastern Africa in Ethiopia, Uganda, Tanzania and Burundi, knowledge management had been engulfed with lack of ICT infrastructure; poor funding; lack of interest by users towards understanding various knowledge management systems available; limited knowledge sharing platforms; lack of training of knowledge management; and old traditional approaches still in place (Akuku et al., 2020b; Lemma & Tesfaye, 2017). In Kenya, outdated technology in knowledge portals, low enthusiasms of users of database management, complicated way of relevant finding information in data warehouse, costly training of users on how to effectively use knowledge management tools such as digital library; and under-utilization of tools such as cloud

computing applications due to not linking the knowledge management tools with the vision of the institution (Akuku et al., 2020; Cheruiyot et al., 2020; Kipkosgei et al., 2020, Ongus et al., 2016).

These challenges facing knowledge management had pushed different institutions to consider setting up various frameworks to ensure that implementation became successful and easily compatible with the vision and objectives of the institutions (Ongus et al., 2016). This study specifically focused on ICT tools that could be used in knowledge creation, knowledge storage, knowledge sharing with a view to developing and testing an ICT framework for implementation of explicit knowledge management in secondary schools in Meru central sub county.

1.1.3 ICT Framework for Implementing Explicit Knowledge

A framework was defined as the elementary structure that supported a system (Sikombe et al., 2019). Explained further that it could be ideas and principles that formulated the system that an organization adopted and used. For a normal framework to effectively function, it relied on the kind of management, type of an institution, technology and the culture. A successful ICT knowledge management (KM) framework enhanced ICT tools in knowledge creation, knowledge sharing, knowledge application, and knowledge retention within an institution (Yang et al., 2020). It enabled effective and successful management of knowledge in organization which led to actions that improved services and outcomes (Kaba & Ramaiah, 2020). The main aim of managing knowledge was to improve an institution's performance by getting timely and reliable information to the right people. Knowledge management involved combination of three key resources in an organization that were people, processes and technologies (Zhang & Zhang, 2018). This was enabling the organizations to use and manage information and knowledge in a more

effective and convenient way. This helped to balance organization's information culture and technology culture effectively (Barley et al., 2018).

There had been developments brought about by reliable frameworks implemented in secondary schools to boost explicit knowledge management in developed nations. For example, in America, a state such as Texas has in place Texas education Agency (TEA) which had come up with an educational guide called Effective Schools Framework (ESF) that acknowledged worthy practices and designated precise actions that high performing schools implemented. In addition, American secondary schools had implemented a system whereby the parents could get academic results of their children through accessing a portal in the school's website. These practices were subject learner and problem positioned. (Cram, 2019; Handzic, 2017; Song et al., 2019). In a state such as California, there had been frameworks involved in planning for a new and all stakeholder involved curriculum. The planning involved stages such as stating the problem, gathering a curriculum team from all stakeholder, conducting a need assessment analysis, stipulating what results were expected, chose the content of the curriculum, developed experimental models, came up with the curriculum, shared knowledge and reviewed it (Jami-Pour et al., 2018; Lee & Lim, 2017; Ramy et al., 2018; Sasson et al., 2017).

In Europe, important frameworks approaches had been used especially related to change in culture of the schools in adoption of explicit knowledge; improvement of knowledge storage ways such as through databases that were strong against viruses and cyber hacks; knowledge sharing whereby tacit knowledge from academic staffs was converted to explicit especially through the help of ICT tools; reliable and user friendly computer devices given to students; and installation of network systems in secondary school to

access information such as local area networks (LAN) (Akgun et al., 2017; Aljuwaiber, 2016; Brooke et al., 2017; Buunk et al., 2019; Ceptureanu et al., 2018; Paré et al., 2016).

In Asia there had been partnership of secondary schools with various companies such as Google to train students on how to easily access information online; subsidies on customized internet bundles costs and cheap students' mobile devices; high support by secondary school's management to digitalize various platforms such as use of application when issuing and submitting assignments; rewards had been to students who had come up with various personal software and apps; science congress and symposium participation by students who were given a chance to showcase various scientific and knowledgeable services and products; scholarships awards to students who performed well in secondary schools; and ethical training on how to develop and adopt various knowledge management platforms in schools to avoid misuse of information (Al-Kurdi et al., 2018; Aquilani et al., 2017; Bloice & Burnett, 2016; Chien et al., 2018; Chuang et al., 2016; Chumg et al., 2016).

In developing nations, such as in South Africa there had been emphasis to secondary schools to develop and adopt environmentally knowledge management platforms; trainings to students and school staff on how to search and use information easily; and sensitization campaigns made on the relevance of various knowledge management systems towards academic performance (Fombad & Onyancha, 2017; Khoza & Pretorius, 2017). In Western African nations such as Ghana and Benin, improvements were made towards equipping secondary schools with computers; curriculums advanced to incorporate computer subject into the secondary school curriculum; more emphasis placed on basic ways to avoid being a victim of cyber theft such as not disclosing

passwords and avoidance of using public computers (Boateng et al., 2016; Igbinovia & Osuchukwu, 2018; Kissi et al., 2017).

In East African nations such as Rwanda, Tanzania and Kenya, curriculums were expanded to adopt computer studies; regional workshop to teachers to sharpen their knowledge management skills; governments had established policies such as Teacher Development and Management Policy (TDMP) to support teachers through sponsorship programs where they were equipped with various current developments in knowledge management systems; schools had been able to install secure servers that had improved the accessibility of information; secondary schools had installed CCTV cameras within school premises for security measures and could share information with various parties when crime happened in schools; schools had consulted services of software developers to develop firewalls that students and other users could use to access academic information only and not any other information such as pornographic information (Akuku et al., 2020b; Dewah & Mutula, 2016; Kipkosgei et al., 2020).

Framework for knowledge management was beneficial to teachers and students to enhance performance, however there existed several challenges in adopting it (Castaneda et al., 2016). There were problems faced by many teachers in implementing knowledge management in learning institutions such as secondary schools. In developed nations, stiff competition by various institutions, rapid change of technology, lack of enough funding to keep up with the changing technology, cyber security issues and lack of refresher training to teachers had been causing secondary schools not to reach to their optimum levels (Denford & Ferriss, 2018; Edmondson & Harvey, 2018; Ergün & Avci, 2018). In developing nations, teachers did not have the leadership skills needed for academic growth and students' productivity which had been attributed to poor

knowledge management (Ghobadi & Mathiassen, 2016; Goswami & Agrawal, 2018). Teachers lacked the knowledge of operating the new technological devices needed to transform knowledge for their productivity. Teachers in urban and rural located schools did not participate equally in professional development programs for building knowledge (Jamshed & Majeed, 2019). They also, did not engage themselves in mentoring programs, which affected their improvement negatively in knowledge building and development.

Various ICT enabled knowledge management systems developed had brought about various developments. According to Flor (2018), the nation of Philippines institutions developed an ICT knowledge management system called Sunscope which integrated KM with mobile devices and internet. This enabled the access of knowledge by anyone from anywhere using any device. In addition, they also brought about Mercury, which was a software application that offered an integration with the existing business applications by sending SMS notifications, alerts and messages between users and the enterprise

Kankwatsa (2018) indicated that Reproductive Health of Uganda [RHU] had put up an ICT based knowledge management framework called RHU e-Learning center. The learning center was supposed to equip the learning model, systems and structures so that they would offer service delivery. In addition, it provided technical assistance and support to other IPPF Member Associations (MAs) and other NGOs, as well as a place where the interchange of knowledge and learning experiences can readily take place. However, this system was mainly established for corporates and not individuals.

In Kenya, the government had boosted the secondary schools by providing and equipping them with computers; there were science congress whereby secondary school students went to learn and also show case various developments such as software; computer

subject had been included in Kenya secondary education curriculum as an optional subject for the students interested in computer studies; Communications Authority of Kenya (CAK) had introduced Education Broadband Connectivity Project (EBCP) in which 887 secondary schools in Kenya had been linked with internet; and parents receiving notification through text message or accessing a parent's portal in the school's website to get their children's academic results; students had a chance to access various new resources such as new library books, journals and encyclopedias online even when they are at home; school staff are able to access early information on various crucial meetings in the school through staff portal; schools were able to get more inquiries and complains about their services through the websites; users such as parent are able to get timely information on their financial obligations through the school email; schools were able to teach and relate practically with the world through by connecting internet for the students to get information. However, there had been limited teaching and learning time in secondary schools due to weak infrastructure; scarce funding; poor technology and high illiteracy levels among students to handle computer devices (Communication Authority of Kenya [CAK], 2020; Khamali & Thairu, 2018; Murumba et al., 2020; Odero, 2017; Ronoh et al., 2020).

1.1.4 Secondary Schools in Meru Central Sub-County

Meru central was one of the nine sub-counties of Meru County (Meru County Government [MCG], 2018. Meru central sub-county has fifty-one secondary schools (Ministry of Education [MoE], 2019). These secondary schools were categorized as boys' secondary schools, girls' secondary schools, and mixed-day secondary schools (MoE, 2019). In Meru central sub county, secondary schools faced issues with low knowledge management which had been brought about by lack of or inadequate modern

storage systems for knowledge (MoE, 2018). This led to loss of important information in relation to student performance as well as teacher's conduction of their duties. The schools had been relying on traditional storage forms of information which had been bypassed by time.

Transfer and sharing of information had also been a great issue in those schools (MoE, 2018). The Ministry of Education [MOE] had done the follow-up on issues in relation to knowledge management like putting internet in schools but it had not helped much. Frameworks had been developed in knowledge management but had not majorly touched on explicit knowledge management in secondary schools. Further on, education broadband connectivity project had only been effective in only four secondary schools which were Keeru boys, Katheri boys, Abothuguchi boys, and Kithirune girls' secondary schools unlike other Meru sub-counties such as Igembe south whose ten secondary schools had benefitted from the project (CAK, 2020).

The above arguments showed that there existed structural issues that inhibited effective implementation of explicit knowledge management in secondary schools. The problem had been a great concern in the global context, regional, as well as local concept hence an appropriate framework that could fit secondary schools needed to be put in place. This raised a need to investigate on a reliable ICT framework that could be used for implementing management of explicit knowledge in Meru central sub-county secondary schools.

1.2 Statement of the problem

Organization's competitiveness and survival in the modern knowledge era required that organizations implement effective strategies for managing, leveraging knowledge and maximizing their human capital (Leonardi, 2017). In Kenya, the Vision 2030

acknowledged the central role of knowledge management in boosting international competitiveness, wealth creation and improving social welfare in different sectors. The education industry looked to becoming a more knowledge-led sector by acquiring, managing and using knowledge as a critical resource for growing the economy (Ministry of Kenya, 2018; Kosgei et al., 2020).

With recent advances through internet technologies, the concept of sharing knowledge had undoubtedly exceeded major organizational and also physical community contexts. It had become a global and social context in terms of online virtual communities. Nevertheless, ICT tools in knowledge creation, storage and sharing had not been well articulated in both public and private secondary schools in Kenya. Notably, there were a lot of challenges on how to implement explicit knowledge management practices (Ministry of Education, 2018). Literature showed that explicit knowledge management required proper harnessing of ICT tools in knowledge creation, storage and knowledge sharing mechanisms (Lyra et al., 2016). Explicit knowledge was ideally stored in form of best practices or data that could be easily shared by use of ICT tools, and hence, lack of clear systems and mechanisms of handling it could be detrimental (Lyra et al., 2016). If proper practices and systems of creating, storing and sharing explicit knowledge were not well harnessed, they were likely to affect academic performance in public and private secondary schools in national examinations (Ministry of Education, 2014).

Several studies had been carried out on explicit knowledge management concept but with limited contexts. Flor (2018) and Kankwatsa (2018) concentrated on corporate centered frameworks. Maingi (2013) and Mosoti and Masheka (2014) largely focused on readiness and the extent of adoption of knowledge management in organizations in Kenya. None of these studies had investigated frameworks and systems that were

individual centered. This study aimed to address the above gap and propose an ICT implementation framework for managing explicit knowledge in public and private secondary schools of Meru central sub-county.

1.3 The purpose of the study

The main purpose of the study was to examine ICT implementation framework for managing explicit knowledge in secondary schools in Meru central sub county.

1.4 Objectives of the study

i. To assess the influence of ICT tools in knowledge creation for managing explicit knowledge in secondary schools in Meru central sub county.
ii. To examine the influence of ICT tools in knowledge storage for managing explicit knowledge in secondary schools in Meru central sub county.
iii. To assess the influence of ICT tools in knowledge sharing for managing explicit knowledge in secondary schools in Meru central sub county.
iv. To develop an ICT implementation framework for managing explicit knowledge in secondary schools in Meru central sub county.

1.5. Research questions

The study was guided by the following research questions.

i. How do ICT tools influence knowledge creation in management of explicit knowledge in secondary schools in Meru central sub county?
ii. How do ICT tools influence knowledge storage in management of explicit knowledge in secondary schools in Meru central sub county?
iii. How do ICT tools influence knowledge sharing in management of explicit knowledge in secondary schools in Meru central sub county?

iv. How does ICT implementation framework suits in explicit knowledge management in secondary schools in Meru central sub county?

1.6. Significance of the study

Establishing workable sustainability academic excellence framework for implementing management of explicit knowledge in Meru central sub county public and private secondary schools was indispensable. It would form the basis of setting up a vibrant knowledge management system and facilitated the secondary schools in competing much more effectively in terms of their performance. It would also assist the teachers' service commission in structuring the hiring and induction process of employees to the school due to the available knowledge.

The school principals would understand their role in Education in regard to knowledge management in schools. With a vibrant Knowledge management practice, the senior management of secondary schools would be able to set clear visions that could be achieved within a given time frame. This was because, with the available knowledge, the management could set more accurate objectives that would be possible to attain. This was more on establishing a knowledge base of what the school's reality looked like. The school administrators could also use the findings in making decisions on the ICT infrastructure to acquire and also the technical support needed in readiness for implementation of explicit knowledge management.

The research would greatly help curriculum developers in enabling them understand how to implement knowledge management which could help them tap the knowledge and use it for the benefit of passing knowledge effectively to the generations to come.

The findings would be used by the Ministry of Education to formulate the appropriate explicit knowledge management systems in line with the National ICT Policy that could in future benefit the whole country in managing knowledge in learning institutions. The results of this study could also be used by curriculum developers in developing a curriculum that could support implementation of explicit knowledge management in public and private secondary schools.

The findings of this study could also be used as an alternative strategy by both public and private secondary schools to improve in competitive performance. When the teachers understood how explicit knowledge management affected their instructional methods of teaching in class, it would enable them to adopt the available knowledge management methods in their teaching hence improving their results.

The results would also be crucial in developing educator courses to enhance pre-service knowledge management skills in teacher training colleges. The students would highly benefit in that they were the direct beneficiaries in the knowledge passed on to them by their instructors. They would also have more reference materials for their studies. The society at large would be in touch with how knowledge management could act as a competitive advantage tool in the service industry. Further on, this study would contribute to new knowledge in the management of knowledge in line with ICT tools and their influence in explicit knowledge management.

This study would be able to develop an advanced organizational knowledge management through a proposed model/framework and prototype in reference to creation; sharing and distribution of explicit knowledge. This would be important in developing a clear system that secondary schools could use so as to manage effectively explicit knowledge within their institution.

1.7. Scope and delimitations of the study

This study focused on examining ICT implementation framework for managing explicit knowledge in secondary schools in Meru central sub county. It specifically focused on knowledge creation, knowledge storage, knowledge sharing, and develop an ICT implementation framework for managing explicit knowledge in secondary schools in Meru central sub county. The principals, teachers, school board chairpersons and head prefects took part in the survey. There was the creation of the system prototype also to aid the validation of the proposed framework to be part of the scope.

1.8. Limitations of the study

The study was conducted in Meru central sub-county where the number of boys' secondary schools were more than that of girls' secondary school (MoE, 2018; 2014). This meant that the number of male students' respondents would be more than of female respondents leading to gender inequality in data collection. However, the study employed stratified sampling method to collect data on equal number of boys' secondary schools as well as girls' secondary school. The second limitation was that the teachers who were agents of passing explicit knowledge had diverse noticeable capacity and ability in knowledge management due to different factors such as experience, training, and exposure among others. However, this study inquired more on the school's capacity and systems available more than personal attributes. The third limitation was that the study did not develop full ICT knowledge management system but a prototype, hence the prototype was not implemented in all the secondary schools but only one school that was used for validation of the proposed framework.

1.9 Assumptions of the study

This study made some assumptions as follows:

i. It assumed that there were knowledge management practices in secondary schools

ii. It assumed that the respondents understood the value of explicit knowledge in secondary schools

iii. It also assumed that there existed infrastructure for explicit knowledge sharing in secondary schools.

iv. The availability of ICT tools in Secondary schools that aided in knowledge management processes

1.10. Definition of key terms

ICT

This was the process of interacting and transmitting data through use of computerized systems (Ngulube, 2017).

Knowledge Creation

This was the process of establishing novel thoughts (Cumari, 2018).

Knowledge Management

This was the cycle of data procurement, dissemination, overseeing and utilizing information in a firm. It was additionally used to mean a multidisciplinary approach utilized by firms in accomplishing their targets through utilizing information (Fombad & Onyancha, 2017).

Knowledge Sharing Systems

These were the frameworks supporting the cycle whereby inferred or unequivocal information was imparted to various people. They were likewise used to mean information storehouses (Ngulube, 2017).

Knowledge Storage

This comprised of maintenance and keeping of both individual and hierarchical information in an effectively retrievable structure (Odero, 2017).

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter explored various literature and presented per study's objectives. The specific themes covered the ICT tools in implementation of explicit knowledge management, knowledge creation, knowledge storage, knowledge sharing and frameworks. The chapter concluded by providing a theoretical framework and a conceptual framework.

2.2 ICT tools in Knowledge creation and implementation of explicit knowledge management

Knowledge creation was the process of establishing novel thoughts (Cumari, 2018). For knowledge to be implemented, it had to be present. Being present was brought about through creation. Knowledge creation involved coming up with fresh ideas on a particular subject matter. It comprised of socialization, externalization, combination and internalization (Alvarenga et al., 2020; Iqbal et al., 2020; Kianto et al., 2020). Socialization was the process of learning various society norms and values (Mclver & Lepisto, 2017). Externalization was the process whereby a person expressed their ideas to other people (Nunes et al., 2017). Combination was the process of gathering information in and out of organization which was later joined together through editing to form a more composite source of information (Pineda et al., 2020). Internalization was the process of incorporation of both personal and other opinions to generate a new identity (Ramy et al., 2018).

There were studies done in developed nations such as Carter and Istenic (2018) examined how high schools had been using ICT tools like social media platforms to improve learning process. Carter and Istenic (2018) acknowledged that in the 21st century, social media had been part of life hence shunning away from it would not make it go away. This was because, almost three quarters of America's high school students were actively engaged on social media. These students shared a lot in their lives beginning from what they ate, how they slept, their homes, vacations and their temporary jobs that they did during summers. Carter and Istenic (2018) indicated that as a result, the schools had begun using the same social media platforms to improve learning process.

The various innovative ICT tools used by high schools in America included writing blogs on various subjects in which the school directed students to read the blogs and answer assignments; teachers had been able to post a query on a subject that students were required to comment on what they thought about the query. It would be a provoking question that related classwork to the current trends in the country. However, Carter and Istenic (2018) did not reveal the measures that the school administration had been using to ensure that students got interested in various social media posts and how they kept track on the students while online.

Hunter and Brien (2018) explored ways in which high schools created knowledge thereby refining their school through ICT tools. Hunter and Brien (2018) considered a sample size of 88 junior high school going peers in Australian high schools who were grouped into 11 focused groups. According to Hunter and Brien (2018), there had been content knowledge creation through banners and social media platforms such as Facebook, Instagram and twitter. These platforms had enabled students to air their voice. The study

further shared that use of metal detectors when getting security clearance to access school premises had made students feel safe in school; address by various speakers on matters pertaining to health, nutrition and academic performance had improved loyalty and belongingness; and use of teaching aids such as notes hand-outs, computers to take notes; emails to get soft copy information. Hunter and Brien (2018) concentrated more on digital technology and did not investigate other non-digital ways of sharing knowledge.

Manca and Grion (2017) investigated how participation of secondary students in school matters could be improved by using Facebook. Manca and Grion (2017) were concerned that the voices of the students on quality of education were not being heard before. Manca and Grion (2017) therefore used 98 secondary school students in Europe to get their views in a Facebook created group. It was noted that students did not contribute a lot in the Facebook group because of fear of victimization when the school authority read the comments from students. Manca and Grion (2017) revealed that poor school policies and resistance of the school in joining Facebook with school matters were contributory factors of students not creating knowledge as intended. Manca and Grion (2017) failed to include the views of teachers on the said topic and only relied on student's views.

In addition, Yoo et al. (2020) examined the implementation of visionary leadership in Korean and American high schools hence creating quality knowledge creation practices. This study used work concern and caring learning environment. Yoo et al. (2020) who interrogated principals, teachers and students in both Korean and American high school, established that when a principal provided quality leadership, there was a caring learning environment which facilitated knowledge creation practices. In addition, Yoo et al. (2020) posited that once learning environment was improved, teachers became more concerned in their teaching hence easily created knowledge such as going an extra mile

of one-on-one consultation with the learners. Yoo et al. (2020) failed to acknowledge that for knowledge creation process to succeed there was a need to also focus on availability of resources which was not in the case of that study. The present study covered this gap by exploring the various resources used and challenges encountered in acquisition of resources to make knowledge creation in secondary schools in Meru central sub county successful.

Tootell et al. (2020) exploited on how knowledge was created and coordinated in a university set-up. The study utilized 36 respondents who were well knowledgeable in the creation process. Tootell et al. (2020) noted that having an opportunistic action among members play as a major barrier to knowledge hence loss of investments in the knowledge creation implementation process in the university. This was whereby, people involved in the creation process imposed their ideas on others so as to gain a personal competitive edge at the opportunity cost of organization's goals. Tootell et al. (2020) named opportunistic actions as the main barrier on knowledge creation. The study did not investigate other barriers such as people not getting involved in externalization for fear of losing their jobs and low awareness on the relevance of letting other people know the knowledge they possess. Therefore, the current study investigated the impact of these barriers in the organizations such as secondary schools in Meru central sub county.

In developing nations, Maisamari et al. (2018) assessed how Nigerian secondary school teachers used Information and Communication Technology [ICT] to create knowledge within the school environments. Maisamari et al. (2018) used a sample size of 140 secondary school teachers in Anyingba region, Nigeria. The study gathered that teachers poorly utilized ICT tools to teach and create knowledge. It was discovered that teachers were better off with printed hand-outs rather than sending an email to colleagues on the

same. This was greatly caused by lack of computers and ICT skills by teachers. This created a need to ascertain the skills capacities of secondary school teachers in utilizing ICT tools towards knowledge creation.

In Ghana, Bosu et al. (2019) surveyed how senior secondary school accounting teachers were coping with academic knowledge creation. To make the study successful, multi-stage sampling was used to select 81 accounting teachers, 482 students in 60 secondary schools. Bosu et al. (2019) used questionnaires, interviews and observation methods to collect data. The study revealed that they purposely sampled 12 teachers from the 81-accounting teacher pool who were observed during a lesson. The findings indicated that in as much as the teachers had robust accounting knowledge background, they struggled communicating the knowledge to the students. Bosu et al. (2019) did not extensively examine other types of teachers apart from the accounting ones. This created a gap to explore how teachers in Meru central sub county secondary schools were coping with academic knowledge creation.

El Nagdi and Roehrig (2020) conducted an exploration on how Egyptian Science Technology Engineering and Mathematics (STEM) system was bringing about evolution in secondary schools. El Nagdi and Roehrig (2020) admitted that indeed schools had expanded due to growing students' population. 7 teachers from Egyptian high schools were interviewed as well as documents analysis done from ministry of education and education consortium for the advancement of STEM. Teachers were discovered to have experienced a deep transformative transformation phase from conservative teachers to teachers with a new mentality and student-centered classroom activities using inductive and deductive data analysis. The teachers developed clear conceptualizations of STEM education, highlighted the importance of teamwork, critical thinking, and inspiration for

teachers interested in working in a STEM environment, and saw themselves as getting closer to being existing STEM teachers. However, the 7 number of teachers interviewed was small for analysis purposes.

Akinnuwesi et al. (2020) reported reasons of why universities in Nigeria came up with knowledge grid to be able to manage information and easier partnership amongst themselves. Akinnuwesi et al. (2020) complained that in as much as there were 47 and 79 public and private universities respectively, they had been managing information through their own private networks. According to Akinnuwesi et al. (2020), Nigerian universities had not yet embraced technological advancement to allow them store their research output such as journals and books in a public grid accessible to everyone. This resulted to challenges in creating and implementing new knowledge due to plagiarism concerns. Akinnuwesi et al. (2020) advised that if students from one university had access to academic research in another university, they would enrich their work through wide reading and citations. However, lack of access had led to continuous repetition of the same knowledge just to graduate and in which little or no value was added in their fields. Akinnuwesi et al. (2020) left the study hanging on various types of knowledge grid models that had been used before in both advanced and advancing nations so as to consider the option of adopting one model to use.

Adding to that, Mtega and Ngoepe (2020) examined how rice farmers in Tanzania incorporated various knowledge management practices. This study collected data from 225 farmers using questionnaires. The farmers were inquired on where and how they access, share use information on rice and other agricultural production. According to Mtega and Ngoepe (2020), few farmers had access to reliable ICT information accessing tools such as internet enabled mobile phones and televisions. Those that had these tools, did not

have reliable institutions that would offer information, the cost of accessing information was high and most common was that they got misleading information on various platforms which led to losses when they implemented. Mtega and Ngoepe (2020) therefore recommended that there should be a development of reliable information infrastructure which guided farmers and farmers should access internet enabled devices at a subsidized cost or on flexible terms. Mtega and Ngoepe (2020) failed to stipulate the influence that training had on evaluating the authenticity of these sources of information. It was one thing to be informed, and also another thing to re-create knowledge through sharing of ideas to other close people like employees so as to benefit in daily operations.

Mburia (2020) appraised knowledge management practices used in appraisal of Tharaka Nithi County projects. This study utilized 120 managerial and other members of staff in the Tharaka Nithi county government. Mburia (2020) established that due to low knowledge management, there had been unsuccessful street structures which were affected by modest speed in the implementation of open base ventures; under uniform open pleasantries; non-network of the national matrix line to mechanical planned areas; insufficient relief initiatives in agrarian territories; and derelict motorization of once-serious project undertakings. Mburia (2020) therefore concluded that knowledge creation had a significant relationship with improved projects performance. Since this study was conducted on Tharaka Nithi projects, there was need to shift focus and consider whether a project such as in secondary schools in Meru central sub-county would improve information delivery performance or not when implemented.

2.3 ICT tools in Knowledge storage and implementation of explicit knowledge management

Knowledge storage comprised of maintenance and keeping of both individual and hierarchical information in an effectively retrievable structure (Odero, 2017). Knowledge storage could take different forms such as reports, database, books and documents. When knowledge was efficiently and effectively stored, it was easily retrieved when needed; it was still in the original state as to when it was stored; it could be updated; and reliable when making decisions (Cheruiyot et al., 2020; Denford & Ferriss, 2018). Knowledge storage improved competitive advantage of the organization since it was viewed as reliable (Fombad & Onyancha, 2017; Hashmani & Ali, 2016). Literature done on knowledge storage cut across developed and developing nations.

In developed nations, a study such as Oktarina et al. (2020) investigated improvement measures put into place in high school archives in industrial revolution era. With 10 high schools in Semarang as the target population, the study aimed at collecting data from the principal, teachers, admin, students and parents. Oktarina et al. (2020) discovered that the schools mainly relied on physical files that did not have any form of back-up. These files would be sent to archives using a non-documented old system. It became hard for a person who did not work at archives to retrieve data since the current archival mechanism was only known by few people working within the archive department. Oktarina et al. (2020) gave the various improved systems that could be used when archiving and retrieving using the integrated archiving process. They included alphabetical, chronological system, basic question system, regional and number system. This raised a need to examine various ways in which secondary schools in Meru central sub county archived their information.

European Commission (EC, 2020) considered cloud storage as a digital print towards improving the European digital future space in schools. According to EC (2020), being able to store data in cloud not only did it improve openness but also ensured competitive advantage of learning institutions involved. The report documented that a cloud storage program called European Open Science Could (EOSC) gave a chance to 1.7 million researchers and over 70 million high schools students and staff with interest in science and technology to store their information safely in cloud. This information varied from innovativeness and invention. The information stored was highly used in both public and private institutions to make decisions on diverse areas.

Further on, Silva and Lima (2017) conducted a study on the purpose of information systems in management of staff in private high schools in Europe. Silva and Lima (2017) pointed out that staff management had grown and changed over time especially on the account of introduction to computerized system in the profession. According to Silva and Lima (2017), the schools relied heavily on how they collected, stored and used information of employees. Various secondary schools had information pertaining an employee who had worked in more than fifty years in their database. This information was stored in a way that employees did not have to always provide certain information over time such as banking accounts for salary processing at the end of month especially due to loss of data.

Silva and Lima (2017) stated that there was a biometric system which helped the academic institution employees to sign in and out when reporting to work and when going out. This information was stored in a secure place and in which it was used in calculating how many days employees had worked for salary processing. Schools had gone to an extent whereby they had a reliable system in which potential employees

applied and their information was recalled when they are being hired. This growth in high school's human resource management was made possible through use of reliable database store in secure servers. Silva and Lima (2017) named only two ways of storage used by human resource department such as database and servers. The study did not mention other ways such as documentation and reports as a way of storing high school employee data.

Adding to that, Zhang et al. (2020) studied how high schools in China had been able to go on despite physical suspension of classes due to covid-19. The government of China put up in place a program called suspending classes without suspending learning. This was an online program that enables China high schools to go on with learning at their homes. According to Zhang et al. (2020), this program had its share of storage weaknesses which mainly revolved around low availability technological devices that enabled students to access and store all assignments and class notes; poor access to reports and documents that consumed high storage capacities in computers; poor storage techniques among students whereby they either forgot to store the documents hence losing them or did not know how to store them; too many documents that a student could not relate their relevance in their courses due to direct downloading of notes by many teachers. There was therefore need to assess how Kenyan students were able to store knowledge and challenges facing them as they performed the storage tasks.

Alvarenga et al. (2020) evaluated how public sector had transformed their digital platforms. The study used literature review, information from Scopus database and combined that with questionnaires from 54 employees from the environment department in Portuguese. Alvarenga et al. (2020) revealed that information on how government entities had improved on using digital storage in their knowledge management was

scarce. Little was known on how government information was stored and in what manner. The findings also indicated that the performance of the digital government continued to be linked to the level of information management of organizations, complemented by substantial changes in the public sector. Alvarenga et al. (2020) only investigated one ministry in Portuguese which was the environment ministry. No information had been provided on storage management of knowledge in other ministries such as education, health and finance. The current study would explore further various ways through which government institutions such as secondary schools in Meru central sub-county have been storing their information.

In developing nations, Durodolu and Mojapelo (2020) explored the practicability of knowledge management in the education sector in South Africa. While using secondary data from conference proceedings, journal articles and reports, Durodolu and Mojapelo (2020) gathered that a lot was needed to be done as pertaining to knowledge management. This was because, most schools were racially divided whereby the white schools seem to be advanced on knowledge access, storage and use. On the one hand, they had databases that were well preserved in secure servers which made it easy to retrieve information of education purposes. According to Durodolu and Mojapelo (2020), on the other hand, the Africans schools got challenges in information storage capacities where they struggled in maintaining the quality of documents for future references. The documents and examinations were stored in a clumsy area which had no one assigned to it for organization. Durodolu and Mojapelo (2020) only concentrated in two races which were whites and Africans hence did not consider other races and how they were managing knowledge.

Odeniyi and Adeyanju (2020) assessed how Federal capital territory secondary schools were maintaining and storing their school records. The study sampled ten secondary schools in whose 80 respondents who work within the record department were used. According to Odeniyi and Adeyanju (2020), secondary schools stored information in log-books, attendance register, lesson plans, syllabus, staff movement book, visitors' book, admission and withdrawal register among others. The study gathered that records were not well maintained, low funds, poor back-up of the records and lack of training by teachers on effective storage of records were some of the issues affecting the secondary school's records storage operations. Odeniyi and Adeyanju (2020) did not explain how the study sampled the ten-school target population and also the respondents.

Further on, Ojo and Adu (2018) documented on the role played by ICT tools in teaching and learning in Eastern Cape secondary schools. Ojo and Adu (2018) focused on the presence and usage of ICT tools in secondary schools by teachers and students. The study utilized 450 students and 150 teachers who answered separate questionnaires. According to Ojo and Adu (2018), mobile phones were majorly used and easily available to get information. However, many mobile phones did not have high storage capacity leading to frequent deleting on information so as to accommodate newly downloaded information. Even though they used memory cards, they were prone to frequent clashing causing massive loss of data. Ojo and Adu (2018) suggested that more training was needed on how they could link their mobile phones to emails to store documents for future reference instead of deleting them.

A report by United Nations Educational, Scientific and Cultural Organization (UNESCO, 2019) documented on how education quality could be enhanced in Rwanda secondary schools through mobile learning. The various schools in Rwanda had gotten a rare

opportunity of laptops and tablets supply for learning. These opportunities boosted their education delivery mechanism whereby they were not able to get information in soft copy format which was less bulky and cost effective hence making the learning process efficient. UNESCO (2019) agreed that early exposure to various academic knowledge tools, provided an environment for the students to be equal with other high schools in different regions of the World. UNESCO (2019) exposed that full implementation of the ICT program had faced issues such as low storage capacity of the laptops and tablets in such that it could not store educational documents that required more storage space; various storage devices were inaccessible and the ones available were very costly; and low awareness on various storage platforms such as how cloud storage work. UNESCO (2019) concentrated on just virtual storage devices and did not address physical storage such as libraries which store documents, reports and the preservation methods of hard copies. Therefore, the present study sought to address this gap when the influence ICT tools on knowledge storage in implementation of explicit knowledge management in Meru central sub county secondary schools would be known.

A book written by Ngulube (2017) documented on how developing nations had been advancing socially, culturally and educationally to formalize indigenous knowledge. According to Ngulube (2017), the development of ICT tools majorly boosted ways to formally capturing, storing and retrieving previously known indigenous knowledge for future use. Since developing nations had passed traditional knowledge from one generation to the other, the capacity to pass correct knowledge was mainly anchored on the ability of the knowledgeable person to remember. In case they suffered memory loss; valuable information was considered lost. However, having various storage sources such as documentation, recording of both audio and videos promoted availability of

information, when need be, to anyone with the access. Ngulube (2017) cautioned that if information sources were not well-preserved, knowledge could be tampered with or simply in evidently lost without a cause.

In Kenya, Odero (2017) analyzed the influence of knowledge management on competitive advantage of audit firms in Kenya. Odero (2017) sampled 80 questionnaires in which 78 are answered by Grant Thornton staff. The study established that when knowledge was effectively managed through creation, storage, and shared, it increased the competitive advantage of an organization. This was because in audit firms, the more knowledge an auditor possessed, the more valuable their audit process would be to the stakeholders of the organization. According to Odero (2017), firms needed to strive to accumulate as much information as possible.

However, their capacity to store and retain the information for a long-term in its original capacity played an important role when a decision was made by the management on using the information. In addition, majority of the study participants accepted that the organization had a robust, sufficient database hence ICT structure was noted to provide reliable knowledge when need be and decisions could be trusted. Odero (2017) used one study case of one firm which had limitations of easily being biased on the findings hence the current study would use secondary schools in Meru central to ascertain the nature of competitive advantage they had on reliable knowledge management practices like libraries for effective storage.

2.4 ICT tools in Knowledge sharing and implementation of explicit knowledge management.

Knowledge sharing was the process through information was transferred from one person to the other within an organization or from different organizations (Lyra et al., 2017). The transfer of knowledge could be at peer level of peer and senior level of interaction. Knowledge was shared through conversations, meetings, learning sessions, workshops, and seminars (Choi, 2016; Igbinovia & Osuchukwu, 2018). Shared knowledge was key towards making sure the procedures of the organization were well known to everyone; there was consistency in operations in organization; and less time wasted (Kalema et al., 2017; Lyra et al., 2017). There were studies that had been done in developed countries. According to Konig et al. (2020), there was a dire need for high school teachers in Germany to adapt online teaching very fast to facilitate knowledge sharing even when there was covid-19 pandemic.

Konig et al. (2020) evaluated how high school teachers had been adapting and sharing knowledge to students during covid-19 school closure in Germany. The study collected data from 89 lower secondary school teachers from Cologne region. Konig et al. (2020) asserted that after covid-19 struck the World, everyone was affected to a point that students were forced to stay at home as a result of the closure of schools. However, teachers had been greatly using online platform to teach and meet students. They were also sending emails of assignments to students. More focus was put into place where direct consultation was done via telephone calls. Since this study was done in Germany, the present study would investigate how secondary schools in Meru central sub-county, Kenya, were sharing knowledge during the covid-19 pandemic.

Asterhan and Bouton (2017) investigated how secondary school's students shared knowledge amongst themselves through social networks. According to Asterhan and Bouton (2017), secondary school students engaged more frequently on social media sites such as Facebook, twitter, Instagram, telegram, and WhatsApp. Asterhan and Bouton (2017) conducted two surveys in Israel teenagers who communicated in Hebrew and were high school students. The first survey had 206 teenagers who were examined on their knowledge sharing ability on social media frequency use. The second survey examined on teenager's knowledge sharing ability on secondary school information. The first survey results indicated that teenagers shared knowledge between themselves on various issues such as celebrity gossips, politics, sports and memes. However, this was mainly limited to gender and moral values. Teenagers shared through direct messages, tagging and posting. The second survey results indicated that teenagers' ability to share information was mainly anchored on the availability of resources such as soft-copy notes, internet to download and computer devices. Asterhan and Bouton (2017) study was mainly done on secondary school teenagers who only spoke Hebrew and no other internationally recognized languages such as English. Therefore, it was expected that these teenagers who shared knowledge were related to Hebrew cultural activities which was not mentioned by the study.

Cheng (2020) explored how learning institutions in Hong Kong were transferring knowledge to staff. Cheng (2020) uses 1014 stakeholders in 20 high schools learning institutions to conduct descriptive type of research design. The stakeholders varied between teachers, parents and non-teaching staff. Cheng (2020) gathered that knowledge was previously shared through training plans, workshops, seminars, direct talks and work-based studies. However, Cheng (2020) complained that the trainings offered were

expensive hence less attractive to stakeholders such as parents. There was also a limitation of types of knowledge shared since it was not relatable to the non-teaching or support staff hence a high level of detachment. Cheng (2020) did not take into considerations the views of suppliers in their study. Suppliers of various products and services need knowledge shared with them such as when their payments were due and when to supply next products and services.

Lin and Huang (2020) reviewed how knowledge sharing impacted personal learning among students in Taiwan universities. The study picked 218 students who were pursuing undergraduate business degrees from two universities to answer the questionnaires of the study. Lin and Huang (2020) found out that when students frequently shared knowledge amongst themselves, they improved their various personal learning initiatives. This was detected as they had more contribution of points when they were required to share knowledge next time. According to Lin and Huang (2020), the extent of knowledge sharing was greatly hampered especially when unreliable knowledge found its way among students. Unreliable knowledge led to students getting false information which negatively affected their reasoning or made bad decisions based on wrong information. Lin and Huang (2020) did not explain how the study sampled 218 students and was not clear what the target population was originally.

Turning our focus to United Arab Emirates, Jarrah and Alkhazaleh (2020) explored how learning institutions such as universities had been portraying the knowledge sharing behavior. Jarrah and Alkhazaleh (2020) sampled 335 university professors who categorically stated that in as much as they were knowledgeable, there was little follow-up by the learning institutions on their various knowledge sharing behaviors. In addition, the learning institutions had a poor planning on the curriculum that the professors were

to share with students and other academic staff. Lastly there was low confidence that indeed they could deliver knowledge creatively thereby relying on well-known methods such as lectures, meetings and much printing. Jarrah and Alkhazaleh (2020) discovered that there was no significant change of knowledge sharing behavior among the professors. Jarrah and Alkhazaleh (2020) did not consider the views of assistant professors and academic doctors who had same academic qualification such as PhD as the professors.

Hammouri and Altaher (2020) conducted an analysis on how employee got satisfaction when they shared knowledge. The study reviewed 8 ways through which employee shared knowledge such as official training, reports, meetings, workshops, mentoring and coaching programs, one on one discussion, emails and cloud storage. Working on a sample of 234 employees from 5 organizations in United Kingdom, Hammouri and Altaher (2020) discovered that when employees were capacitated and authorized to share knowledge, they derived more satisfaction from their daily job routines. The study cautioned on complete access and authorization of knowledge sharing since destructive knowledge could impact negatively the employees whereby, they lost focus on achieving set targets. For example, there could be a limit to the language used to avoid verbal abuse or ill-talk from one employee to the other. There was need to investigate whether secondary schools in Meru central sub-county got more satisfaction when they shared knowledge and negative attributes of unlimited knowledge sharing towards implementing explicit knowledge management.

In developing countries, Kalema et al. (2017) explored how use of IT had improved knowledge sharing among secondary school teachers in developing nations. The study specifically dwelled in Tshwane district secondary schools in South Africa as a case

study. Kalema et al. (2017) were concerned with the growing gap between the rich and poor students in accessing knowledge related to mathematics and science. This was whereby the students who were poor relied on textbooks that were old-version, whereas the rich students got updated though internet on any slight changes of the syllabus. These differences made poor students develop a negative attitude towards mathematics and sciences leading to high drop-out of school. The teachers responsible felt that access to internet through use of computers would boost knowledge sharing to all students irrespective of their wealth status. Adding to that, there were few teachers who were well versed with IT related issues. These IT proficient teachers were overworked causing them to experience mental drainage. Continued mental drainage led to teachers quitting in alarming rates. Kalema et al. (2017) did not explore the contribution that the government had made towards IT installation in secondary schools so as to extensively conclude IT was limited. Further on, there was no revelation on the number of teachers that were being trained on IT at the time of the study.

In Nigeria, Opeke et al. (2020) examined the knowledge sharing requirements that were needed to ensure STEM courses adoption by girls in secondary schools in Northern central area. Opeke et al. (2020) used multi-stage sampling method to sample 361 girls' students who answered the questionnaire. The results revealed that when efficient knowledge was shared on both pros and cons of the STEM courses, the students were more attracted on STEM background subjects that would enable them study the courses. The various ways of sharing knowledge included dialogues, policies, letters and documents. Opeke et al. (2020) gathered that there was less motivation such as rewards and prizes when they performed well on STEM subjects by the secondary schools. Further, knowledge sharing methods such as peer discussion, science clubs were missing

in girls' secondary schools. The study did not examine boys' secondary schools creating a gap in this study. The current study would include boys, girls and mixed secondary schools in Meru central sub-county.

Idhalama and Echedom (2021) scrutinized the level of awareness of Nigerian teachers on knowledge sharing behavior in high schools. Adopting a descriptive research design, the study collected data from 244 teachers. Idhalama and Echedom (2021) found out that knowledge sharing awareness was high. Further, the sharing behavior between experienced and less experienced teachers was similar however, school policies limited the extent of knowledge sharing. For example, the school policy limited normal teachers from sharing knowledge to students and their colleagues on sensitive matters that would disrupt the normal operations of the day. Idhalama and Echedom (2021) therefore concluded that school policies could be regulated to allow more interactions between the senior and junior teaching staffers. However, Idhalama and Echedom (2021) did not investigate knowledge sharing behavior and awareness among non-teaching staff in secondary schools.

Eiriemiokhale and Idiedo (2020) reported on various information sharing practices that Nigerian universities' lecturers used. Paying attention to Kwara state university, Eiriemiokhale and Idiedo (2020) sampled 217 lecturers using simple random method in the 7 faculties. Eiriemiokhale and Idiedo (2020) found out that there were various ways of knowledge sharing such as publishing books and journals; one and one discussion of projects with peers; sharing course outlines; sharing information via mobile phones; sharing the findings of their research on social media and newspapers; and participating on video and physical meetings and conferences. Eiriemiokhale and Idiedo (2020) pointed out that the lecturers faced issues with lack of system through which they shared

knowledge; poor reception of knowledge shared by colleagues especially on research findings; lack of rewards when one shared knowledge; and bureaucracy in the university whereby a junior could not share knowledge with a senior due to fear.

Eiriemiokhale and Idiedo (2020) used an inappropriate sampling method since there were actually four levels of academic lecturers such as junior and senior lecturers, assistant and full professors. Lecturers were academic staff who had high qualifications such as master's degree and above. The best sampling method would have been purposive sampling method to distinguish which lecturers were considered and what qualified them to be considered. The present study investigated some of the ways through which secondary school teachers shared information and challenges they faced.

Akosile and Olatokun (2020) explored how Bowen university academics in Nigeria were sharing knowledge and what elements were influencing their decisions to share. Akosile and Olatokun (2020) approached the study using survey method to gather data from 151 academics. According to Akosile and Olatokun (2020), an academician was taken to be any person who had interest in university education and preferably had a direct interaction with university resources. This could be students, academic and non-academic staff. The study gathered that only university policy among other the organizational factors such as availability of resources, bureaucracy, and work load had a positive influence in knowledge sharing. Trust and gender were personal factors that portrayed an influence among other factors such as money, educational level, marital status and age towards knowledge sharing. Akosile and Olatokun (2020) complained that rewards were not part of the university policy towards motivating academics into sharing knowledge.

In Kenya, Kimile et al. (2020) concentrated on how public universities community of practice (CoPs) had been sharing information within the university environment. According to Kimile et al. (2020), CoP was when a group of people came together to learn and interact with each other so as to develop and advance what they knew especially on shared interest in an area. Kimile et al. (2020) used secondary data from written journals and books to establish that universities allowed socialization whereby people were allowed to share information through emails, WhatsApp messages, text messages, phone calls, discussion groups and one on one lectures. Kimile et al. (2020) pointed further that the staff were encouraged to share knowledge through monetary incentives. The problems noted by Kimile et al. (2020) emanated from inconsistency in incentives leading to pre-mature withdrawal from knowledge sharing by staff; lack of enough time to articulately share all information; insufficient ICT infrastructures and meeting spaces. Kimile et al. (2020) investigated only how the universities' employed staff shared information but did not investigate the volunteering university staff such as how visiting professors were sharing knowledge with the university students.

Kipkosgei et al. (2020) evaluated how knowledge sharing affected trust among employees sharing a set of technology in Kenya. Kipkosgei et al. (2020) used 300 employees who were grouped into 75 teams. These teams were analyzed using hierarchical multiple linear regression to establish that indeed when there was knowledge sharing, trust was cultivated to a point that they were free to inquire on areas they did not know in their tasks. This led to an improved growth in the overall firm's targets since the employees easily achieved their set target. Kipkosgei et al. (2020) acknowledged that when employees shared what they knew, they created an environment of teaching and also learning from the positive critiques from their colleagues. However, Kipkosgei et al.

(2020) admitted that negative criticism could lower morale and also result to unnecessary conflicts especially when malicious employees criticized their colleagues. In addition, employees with higher academic and experience qualifications seemed to dominate the knowledge sharing platform thereby intimidating the lowly qualified employees from ever participating in knowledge sharing platforms. This raised a need to investigate how secondary schools-maintained balance so that knowledge shared was free and open to everyone whether qualified or not.

Further on, Mganga (2017) considered the various knowledge management practices in use in Kenyan government ministries and how these ministries had been performing. Mganga (2017) explored only two practices which were knowledge sharing and recycling. Applying the descriptive research design, the study sampled 384 people in the 20 ministries. From the questionnaires answered, Mganga (2017) made a conclusion that Kenyan national government had highly implemented these practices in the specific ministries. However, there were limited safe knowledge sharing platforms in which information would not be leaked to the unauthorized parties such as the media stations. According to Mganga (2017), this was a scenario whereby the media stations had informants in the ministries who shared sensitive information with them for personal gains and favors or political mileage with the stations.

2.5 ICT Framework for implementing explicit knowledge management

Organizations had a day-to-day task of ensuring that the knowledge that could easily be articulated and codified was easily stored and accessed by people in the organization. To facilitate that, the organization maintained various types of frameworks that covered people organization culture, information and communication technology (ICT), processes and structure. A framework was taken to mean as the structure of a knowledge

management system (European Commission, 2020). These types of frameworks on explicit knowledge played a significant role in ensuring that there was a smooth implementation. The process of implementation of Explicit Knowledge Management (EKM) followed a systematic process of first having goals that the organization intended to achieve; come up with change management method; develop a procedure to create a foundation; include the management; evaluate the present state of the organization; assess the strengths and weaknesses of the organization; develop an implementation footprint on where to start (Chuang et al., 2016; Fombad & Onyancha, 2017). Once the EKM was implemented in an organization, it remained efficient, reliable and effective in undertaking its daily operations.

There were studies done on explicit knowledge management implementation. In developed nations, Raudeliūnienė et al. (2020) examined how explicit knowledge management practices in high schools could be an instrument to further sustainable growth. According to Raudeliūnienė et al. (2020), execution of explicit knowledge management practices in high schools was a very effective method in attaining sustainable growth. The outcomes of the study exhibited that the potential for the implementation of knowledge management methods to achieve sustainable development was strong in high schools. Raudeliūnienė et al. (2020) revealed that high schools faced lack of encouragement for teachers and low financial support to introduce knowledge management activities and develop knowledge infrastructure for sustainability.

Cui et al. (2018) explored the developments made on the curriculum system of upper-high schools in China. The study used secondary data such as documents on policies developed to gather data. Cui et al. (2018) found out that the curriculum framework of high school had shifted over time from centralized to sharing-based. The centralized

curriculum was in place from 1949 to 2001 and thereafter the sharing-based curriculum took over. According to Cui et al. (2018), sharing based curriculum focused on positive learning attitude to boost positive values; class-hour proportions for 9-year period education; learning was related to modern society functions; and students were encouraged to think and provide solutions rather than memorize school notes and concepts.

Organization for Economic Co-operation and Development (OECD, 2020) reported the framework that was issued to schools globally pertaining to covid-19 pandemic. The report was fueled due to covid-19 challenges experienced in the year 2020. Many learning institutions such as high schools were closed indefinitely so as to limit movement of people to curb the virus. As a result, OECD (2020) gave directives to learning institutions to change their respective policies such as in high schools seeking for alternatives ways such as online learning, social isolations, partnering with educational private providers, radio and television education. This gave this study a concern to explore some of the frameworks put into place toward combating covid-19 pandemic in secondary schools in Meru central sub-county.

Hudson et al. (2020) surveyed on the consolidated framework factors that influenced execution of Whole School Approach (WSA) program in high schools. The study sampled 2 groups of each 15-senior staff from 5 United Kingdom high schools. They were interviewed on factors implementation of WSA. Hudson et al. (2020) revealed that leadership negative attitude on the program; poor communication on the beneficiaries of the WSA; and poor execution slowed down the process of implementation. Hudson et al. (2020) did not incorporate respondents such as junior staff and students who related with the WSA program first hand.

Nunes et al. (2017) assessed the practices of information management in higher education institution. According to Nunes et al. (2017), the status of Higher Educational Institutions (HEIs) as sources of information had been analyzed and challenged by numerous participants worldwide. HEIs were also making attempts, such as in developing countries, to leverage their knowledge-based strategic tools implementation. Knowledge management (KM) approaches and strategies were anticipated to use information assets of HEIs in compliance with the requirements of the time in order to solve this issue. The aim of the research reported in this paper was to explore and propose a conceptual structure for research on KM in South Asian countries' HEIs. A systematic literature review (SLR) had been carried out in order to identify, pick and retrieve applicable scholarly literature from well-established academic databases by following a precise protocol and a systematic data extraction technique. The study results showed that in both theoretical aspects and empirical applications, insufficient research had been carried out on KM in the context of the HEIs. The findings also revealed various influences that in the context of their professional practices affect KM's main agents, such as faculty, administrative personnel, librarians and HEI information professionals.

In developing nations, Hayes and Bulat (2017) studied the influence of low and medium nations' education policies towards students living with disabilities in secondary schools' programs. Hayes and Bulat (2017) posited that the disabled students were mainly left out due to poor data collected when policies were being changed. As a result, these developing nations tend to assume that the number of disabled students is low as well as their challenges are not considered. Adding to that, secondary schools in nations such as South Africa, Namibia, Zambia and Zimbabwe have complained that there were few resources to cater for all expenditures of disabled students.

According to Hayes and Bulat (2017), there were three models used when developing frameworks to gather knowledge pertaining disabled students in secondary schools in developing nations. They included: Per Capita or Cost-Based Models; Resource- or School-Based Models; Output-Based Models. Per Capita or Cost-Based Models was a formula used on disabled students to determine their expenditure level before funding. Resource or School-Based Models was used when soliciting funds hence comparing services required verses the number of disabled students. Output-Based Models was funding done on disabled students based on their performance hence low-funding to high schools that did not perform well. Hayes and Bulat (2017) complained that though the frameworks were turning out to be successful, there was a gap on implementation.

In South Africa Mkhongi and Musakwa (2020) explored the perception that high schools in Mgungundlovu District had on Geographic Information Systems (GIS) education. GIS was a system that improved new ways of teaching, learning and understanding Geography subject in high schools. Mkhongi and Musakwa (2020) used purposive sampling method to select geography 14 teachers and 60 students in grade 10-12 from 8 high schools. Questionnaires were used as a form of data collection method. Mkhongi and Musakwa (2020) discovered that this education system had challenges such as limited resources, low student exposure on GIS, and lack of proper training on teachers on how to implement the GIS system. Since this was a system used in South Africa, there was need to investigate the benefits and challenges of various frameworks used in Kenya such as 6.3.3.

Thang (2020) investigated how Vietnamese organizations gained, managed and innovated knowledge. Using 130 firms as the sampled population, Thang (2020)

gathered that knowledge acquisition had a positive influence on innovation. Furthermore, this research showed that the personalization approach had a more significant purpose in terms of direct impact on innovation outcomes than the codification approach. Nevertheless, only the codification approach moderated the information acquisition-innovation relationship between the two-knowledge management (KM) strategies.

The findings also indicated that the firm should not be too focused on the implementation of the codification approach in order to achieve a high degree of innovation outcomes without paying due attention to the personalization approach. Thang (2020) added that knowledge gain and personalization approaches led to innovation results for organization at the nascent stage of growth or those in developing countries such as Vietnam. This study was conducted in Vietnamese organizations hence the current study would shift focus to Kenyan learning organizations such as secondary schools in Meru central sub county to establish how they gain, manage and innovate explicit knowledge.

Dei and Walt (2020) explored various Ghanaian universities' explicit knowledge management practices. The study specifically narrowed down to communities of practice (CoP). CoP was basically when a group of people with shared interests came and joined together to learn and share in practice what they had learnt in a specific location. Such as when a group of medicine students learnt about a cell in a lecture, they proceeded to the local hospitals for practical at a group level. Dei and Walt (2020) agreed that CoP was lacking in Ghanaian universities due to poor comprehension of what really CoP is, how it worked and low support of the university system. The study portrayed biasness when it investigated only one type of knowledge management practice and failed to explore other types of practices such as document administration, intelligence gathering, and information mining.

In Kenya, Cumari (2018) examined the knowledge management practices that were commonly used in Kenya Bureau of Standards (KEBS) and which dictated their performance. Cumari (2018) collected data inform of questionnaires from 22 sampled employees from KEBS. The study established that various practices such as knowledge creation, sharing, storage, retrieval and dissemination were used at KEBS. These practices were found to be positively influence performance. However, Cumari (2018) complained that KEBS had not fully maximized on its ICT potential; there was low external stakeholders' participation in knowledge management; and poor risk assessment on information management. Cumari (2018) used a very low number of respondents in the study which was below than thirty which was normally required when collecting data in form of questionnaires.

2.6 ICT knowledge management system Prototypes

Nonaka et al. (2000) examined unified model of dynamic knowledge creation. According to this study, many firms had limited information of how knowledge was created and managed actively. In this view, Nonaka et al. (2000) investigated on how firms created knowledge through socialization, externalization, combination, and internalization (SECI) process, conversion of tacit and explicit knowledge, sharing and the inputs and outputs of the whole process. Nonaka et al. (2000) found out that using existing knowledge assets, an organization created new knowledge through the SECI process that took place where new knowledge, once created, became in turn the basis for a new spiral of knowledge creation. Nonaka et al. (2000) prototype concentrated on only one type of knowledge management process which was knowledge creation and did not investigate

other processes such as knowledge storage and sharing. The current study used a prototype that includes all the knowledge management processes.

Omona et al. (2010) investigated how ICT could be used to improve knowledge management in higher education. The study assessed the technology acceptance prototype as developed by Cloete and Courtney (2002) in which knowledge management was categorized into different stages. These stages included knowledge planning, capture, organize, retrieve, utilize, maintenance, and evaluation. Omona et al. (2010) decision to use Cloete and Courtney (2002) model was criticized that it related to the behavior of users, which was inevitably evaluated through subjective means such as behavioral intention (BI) such as interpersonal influence. Therefore, the current study adopted organizational knowledge management framework which was developed by Andersen and APQC (1996). It involved creating, identifying, collecting, adapt-organizing, applying and sharing of knowledge.

Nguyo et al. (2015) investigated the effect of ICT on sharing knowledge in Kenyan government parastatals such as the library. The study found out that 65.2 percent of any positive changes in the Kenya national library service was due to adoption of ICT tools. Therefore, Nguyo et al. (2015) gave recommendations that the government would increase the annual budget to the parastatals so as to boost their adoption to ICT tools. This study also proposed that the parastatals could ensure development and implementation of Knowledge Sharing policy prototype to strategically alignment of ICT enabled Knowledge sharing with the overall organization objective and management structure. However, the knowledge sharing prototype proposed missed on including storage phenomenon part of it. The current study would thus have a prototype that had storage aspects.

2.7 Summary of gaps

In knowledge creation, the study unearthed that having opportunistic actions among teachers was a major barrier hence loss of investments in the knowledge creation implementation process in secondary schools. These opportunistic actions brought about various information conflicts in which that in as much as information conflicts were good, they hampered any generation and implementation of future new joint information. Studies reviewed did not address the ways in which school administration were using to regulate and motivate students into various types on curriculum knowledge when online. Also, it has been noted that students did not contribute a lot in the Facebook group because of fear of victimization when the school authority read the comments from students. In addition, a lot was done on digital ways of knowledge creation but little was done on non-digital knowledge creation and communication in secondary schools. Studies reviewed also failed to acknowledge that for knowledge creation process to succeed there was a need to also focus on availability of resources which was not in the case.

The reviewed studies on Knowledge storage indicated that there were authentic exposures that full implementation of the ICT program in schools faced issues such as low storage capacity of the laptops and tablets in such that it could not store educational documents that required more storage space; various storage devices are inaccessible and the ones available were very costly; and low awareness on various storage platforms such as how cloud storage work. In other studies, caution was given in that if information sources were not well-preserved, knowledge could be tampered with or simply in evidently lost without a cause. That is, it was hard for a person who did not work at

archives to retrieve data since the current archival mechanism knowledge was only limited to the few people working within the archive department.

From the studies done on knowledge sharing topic, there were numerous complains that the outside classroom training as a way of sharing knowledge in secondary school was expensive hence less attractive to students. Adding to that, the high school teachers were facing issues such as lack of system through which they could share knowledge; poor reception of knowledge shared by colleagues especially on research findings; lack of rewards when one shared knowledge; and bureaucracy in the high school whereby a junior could not share knowledge with a senior due to fear. The other problems noted emanated from inconsistency in incentives leading to pre-mature withdrawal from knowledge sharing by staff; limited safe knowledge sharing platforms in which information would not be leaked to the unauthorized parties; lack of enough time to articulately share all information; insufficient ICT infrastructures and meeting spaces and lack of rewards for sharing knowledge.

The studies reviewed showed that indeed coming up with framework for implementation of explicit knowledge management was possible. However, learning institutions such as secondary schools faced lack of encouragement for teachers and low financial support to introduce knowledge management activities and develop knowledge infrastructure for sustainability. In addition, leadership negative attitude on the program; poor communication on the beneficiaries of the framework; and poor execution slowed down the process of implementation of knowledge management. There were complains about secondary schools not fully maximizing on its ICT potential; low external stakeholders' participation in knowledge management; and poor risk assessment on information management.

The past studies used various information frameworks such as technology acceptance model framework. This kind of framework was discovered to that it related to the behavior of users, which was inevitably evaluated through subjective means such as behavioral intention (BI) like interpersonal influence.

2.8 Theoretical framework

This study was anchored on three theories which were knowledge-based view theory, the resource-based theory and the organization learning theory. Knowledge-based view theory supported the first variable of the study which was ICT tools in knowledge creation. Unified Theory of Acceptance and Use of Technology (UTAUT) supported the second and the third variables of the study which were ICT tools in knowledge storage and sharing. ICT Framework for implementing explicit knowledge management was supported by the organization learning theory.

2.8.1 Knowledge-based view theory (KBVT)

Knowledge-based view theory (KBVT) was developed by Penrose (1959). KBVT stated that since it was difficult to copy information-based assets, diverse knowledge bases and skills among institutions, they were the key elements of long-term competitive advantage and greater efficiency. Corner (1991), further explained that when an institution equipped its' employees with various skills and knowledge that were effectively created within its scope, it became more efficient in its operations as compared to when it did not. An organization had a mandate to always invest in its staff for general purposes of having qualified and efficient staffs who delivered on the set targets which eventually led to the organization attaining its objectives.

This theory supported the first variable of the study which was ICT tools in knowledge creation. KBVT was used in the study because an organization equipped its employees with skill through diverse ways such as allowing them to learn various society norms and values; allow them to expresses their ideas to other people; incorporating both personal and other opinions to generate a new identity; and later on, gathered information in and out of organization which was joined together through editing to form a more composite source of information. Once employees got a new identity within the organization, they became more fulfilled and satisfied to be mentally prepared on achieving the set targets. KBVT was used before by various studies such as Mburia (2020) who examined the knowledge management practices used in appraisal of Tharaka Nithi County government projects.

KBVT was criticized by Foss (1996) that the nature of the company was not sufficiently characterized because KBVT identified the company formation based on employment pact and neglected the tenure of assets. However, this study would not be affected by the limitations since it was more inclined on implementation of explicit knowledge management practices in public and private secondary schools rather than a company

2.8.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

Unified Theory of Acceptance and Use of Technology (UTAUT) was advanced by Venkatesh in 2003. UTAUT explained user intentions to use an information system and subsequent usage behavior. That is, for an ICT system to be considered successful when introduced in an organization, the users ought to be willing to use it frequently in their operations. Quantifying this would be done by examining the difference between the output expectations of the organization, influence of the system socially and technological environment and the user's actual output performance. This theory

supported the second and the third variables of the study which were ICT tools in knowledge storage and sharing. This theory was used in the study because maintenance and keeping of both individual and hierarchical information in an effectively retrievable structure which had the capacity to be transferred from one person to the other, required acceptance and usage of ICT resources.

For reliable, and safe structures to be put into place, organizations would be willing to accept and frequently use various storing units such as servers and hard disks that had huge storage space. Submissive character part by employees to enhance their key skills on new ICT systems was required to ensure meetings, learning sessions and workshops were successful. Therefore, organizations required a calm environment to facilitate meaningful conversations between employees and their trainers for ICT systems equipping. All these factors needed resources such as time, money and space for them to work hence giving the organization a competitive advantage as far as implementation of explicit knowledge management was concerned.

ICT users ought to create a room for learning so that they could be taught on how a specific ICT system works. Having a learning mentality was basically the first step in accepting that there was need to change to the new system. However, learning could not be complete without full implementation of the new system into their daily roles and responsibilities. Therefore, ICT users needed to intentionally start using the new system to perform various functions. Continuous use of the new ICT system eventually helped them master the whereabouts of the new system to a point it became part and parcel of their organization's culture. This theory was used before by various studies such as Liu (2019) to explain how university students had fared in accepting use of physical activity apps.

Moghavvemi et al. (2013) criticized the UTAUT that, there was no consideration done on self-efficacy, attitude and anxiety to be direct determinants of intention. However, the current study was not be limited since the main purpose was not concentrated on intention of creating, sharing and storing knowledge but on the implementation framework for managing explicit knowledge.

2.8.3 Organization Learning Theory (OLT)

Organization learning theory (OLT) was propagated by Nevis et al. (1995). Framework for implementing explicit knowledge management was supported by the organization learning theory. OLT was the capacity to develop, acquire, and transfer information and adjust behavior to represent new information and bits of knowledge. An organization ought to support and encourage members' learning and ongoing change within the organization.

This theory was used in this study because today's organization's demands caused them to have a competitive edge, resulting in a desire for learning hence having a framework for implementation of explicit knowledge management. A learning organization's core attributes included personal mastery, mental templates, mutual vision, reasoning around processes and team learning. This theory inspired and encouraged organizations to move their emphasis to a way of thought that was more interconnected and streamlined. This theory was used by Serenko et al. (2007) in which they advocated for workers involvement in learning aspect in a working environment. OLT was greatly criticized by Fenwick (1996) that organizations failed to develop a framework learning due to employees not agreeing to change and complexity of the whole learning process.

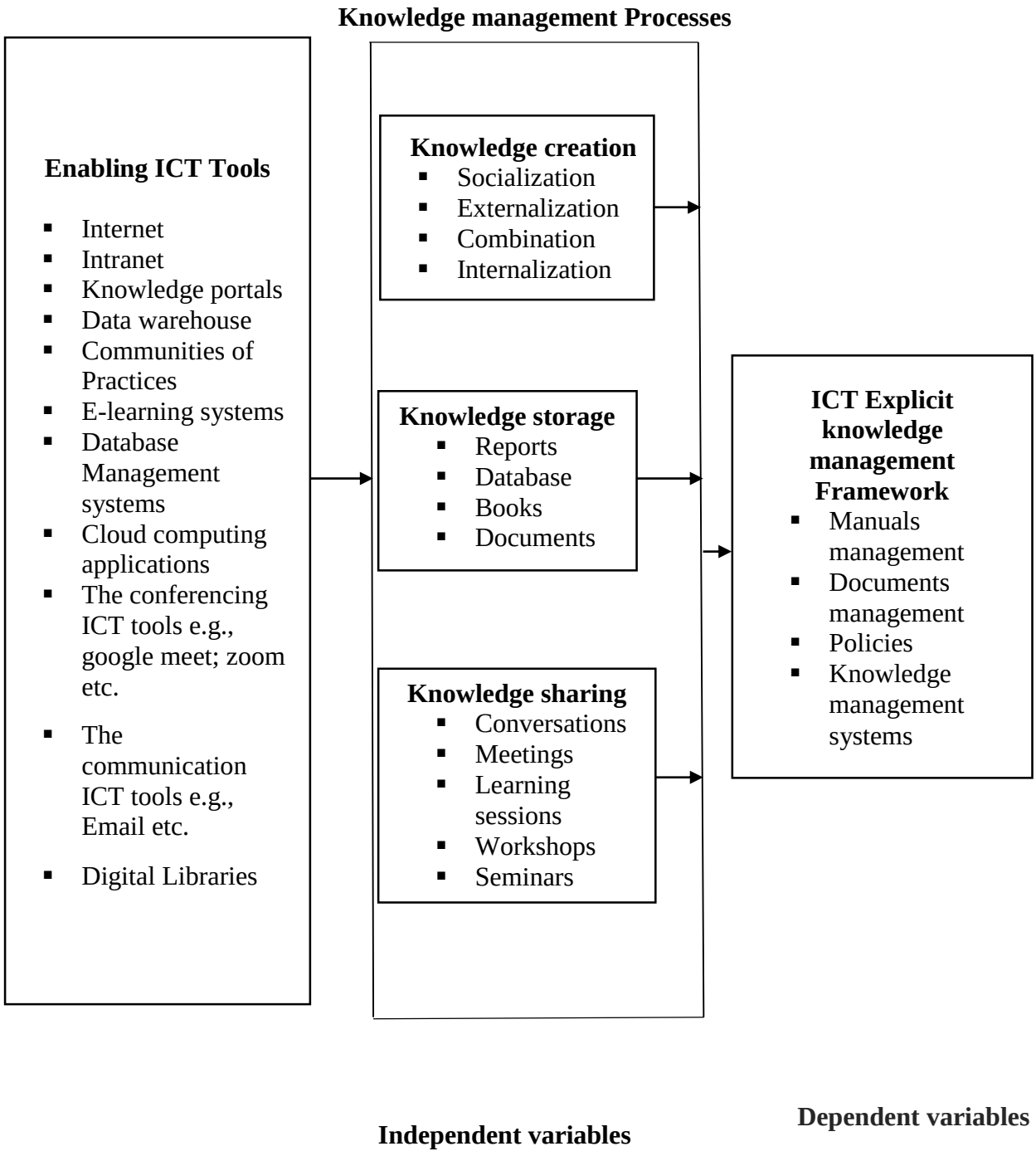
2.9 Conceptual framework

The dependent variable was ICT explicit knowledge management framework. It had indicators such as manuals, policies and knowledge management systems. The independent variables were the three knowledge management processes. That is knowledge creation, Knowledge storage and knowledge sharing. Knowledge creation had indicators such as socialization, externalization, combination and internalization. Knowledge storage had indicators such as reports, database, books and documents. Knowledge sharing had indicators such as conversations, meetings, learning sessions, workshops, videos and audio sessions.

The enabling ICT tools included internet, intranet, knowledge portals, data warehouse, communities of practices, e-learning systems, database management systems, cloud computing applications, the conferencing ICT tools e.g., Google meet; zoom etc., the communication ICT tools e.g., email etc., and digital libraries. Figure 2.1 gives the conceptual framework.

Figure 2.1

Conceptual Framework



CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter showed the methodolgy that was used in data collection, analysis and report interpretation and documentation. Various areas such as the design, location, target population, sample and sampling design were indicated. Further on, data collection instruments, pre-testing, reliability, validity, analysis and ethical considerations were explored.

3.2 Research design

A research design was a plan used in a study to collect, analyse and report the findings so as to be able to tackle the study's main problem (Almalki, 2016). In this study, mixed methodology was used. This was because, the study was using both quantitive and qualititive data. That is, both questionnaires and interview schedules. The main problem was understanding why ICT tools in knowledge creation, storage, sharing and frameworks had not been well articulated. This had been affecting the implementation of explicit knowledge management in the secondary schools in Meru central sub-county. This study adopted and improved organizational knowledge management framework which was developed by Andersen and APQC (1996). This improvement would become the contribution to the body of knowledge. It involved the following steps create; identify; collect; adapt-organize; apply and share.

3.3 System Design, Development and Requirements.

To develop the ICT based knowledge management system, this study used prototyping in system design and development. Prototyping was defined as the procedure of coming up with a model that created an information system that could be comprehendible for end users when adopting it (Denford & Ferriss, 2018). This framework was an improvement of organizational knowledge management framework whereby it incorporated ICT enabling tools in its structure. The results analyzed from the questionnaire and interview schedules were used as the system requirements and user requirements for the development of the proposed system. The sytem requirements were a computer system loaded with at least 2GB RAM memory, Processor, 500GB Hard disk and installed with Operating system, Microsoft office, Internet browser and Antivirus software. The user requirements were a login interface, database, administrator interface, help and faq interface.

There was the design phase which included ERDs, user interface, and system administrator interface. There were also Knowledge creation, sharing and storage interface. The system prototype was developed by use of PHP, CSS, HTML and JavaScript programming languages. Further on, there followed coding, testing, debugging and implementation. The prototype was verified by implementing the prototype in one randomly selected secondary school in Meru County i.e., Giaki secondary school which is a girls' boarding secondary school and has a similar characteristic with the schools in the study. Some of the system modules developed included knowledge creation module; knowledge storage module and knowledge sharing module among other system modules. All the frameworks were enabled through ICT tools such as internet, intranet, knowledge portals, data warehouse, e-learning systems,

database management systems, cloud computing applications, conferencing ICT tools, communication ICT tools and digital libraries.

3.4 Location

This was the geographical boundary where the study was conducted to obtain data. In this study, the location of the study was in Meru central sub-county. It was one of the sub-counties in Meru county. Meru central sub-county had been experiencing challenges in developing and sharing practical knowledge due to very low evaluation of school programs (Maingi, 2013). In addition, Meru central sub-county lacked infrastructure and resources to maintain knowledge in its original form for a long-time leading to loss of valuable information. Further on, the sub-county lacked practicability in managing and maintaining knowledge in the secondary schools. For example, in as much as the schools had libraries, they lacked updated backup of their knowledge (Ahlfeld, 2019).

3.5 Target population

The target population in this study was both public and private secondary schools in Meru central sub-county. Meru central sub-county had 51 public and private secondary schools (Ministry of Education [MoE], 2018). Appendix VI provided their names. These secondary schools were boys, girls and mixed. The main respondents of the study were 477 teachers in the public and private secondary schools. Other respondents included 51 principals, 714 board management members and 51 overall school head-prefect/captain. According to the ministry of education (2018), each secondary school had one appointed school principal making a total of 51 principals. A teacher was any personnel who was authorized to teach students in a secondary school. There were 477 teachers from the Teacher Service Commission [TSC] and Board of Management [BOM] in Meru central sub-county (MOE, 2018).

The study collected data from both the TSC and BOM teachers. A secondary school board management member was any appointed person in the school board who had participated before in board meetings. Principals and teachers were key in a school since they took part towards implementing and enforcing policies especially the one's related to knowledge management. Board members were particulary important especially in formulating policies and frameworks that affected knowledge management in secondary schools.

According to the Ministry of Education (2018), each secondary school in Kenya had 14 members appointed by the County Education Board (CEB). These 14 members included 6 people delegated to account for the guardians' body or the neighborhood local area; 3 people to account for the financial supporters of the school; one individual to be designated by the County Education Board [CEB]; one individual to account for specific vested parties locally; and one individual to account for the disabled people. One teacher to address the school personnel in the school and one ex-officio to represent the students. When all the 14 board members were included in all of the 51 secondary schools, they totalled to 714 board members.

A head-prefect/ captain was any student in charge of all school prefects and appointed by the school management or through voting by the students. They were responsible for explaining the student's perception towards implementation of explicit knowledge management.

3.6 Sample and sampling techniques

Sampling was the process of obtaining a representative proportion from the target population to act as a sample, whose findings were interpreted and accepted as of whole population (Taherdoost, 2016). According to Mugenda and Mugenda (2003), a sample

of 10 to 30 percent was considered adequate enough to represent the entire population. Therefore,the study first stratified the schools into either public or private. Secondly, the schools were stratified into boys, girls or mixed and day secondary schools to obtain the 30 percent from the entire population resulting to 16 secondary schools, the study hence used systematic proportionate sampling method to get equal proportions on the sampled secondary schools stratum. That is, boys, girls or mixed and day secondary schools. Later on, equal samples were taken on each category. This ensured a good representation of all category of schools.

In terms of the respondents, the principals of the selected 16 schools formed the 16 respondents. This was because principals being the head of the school were considered knowledgable on almost every detail of the school. Therefore, there would be need to get their opinion.

As indictaed in appendix (V), the 477 teachers in the study were sampled using proportional simple random sampling method. That is, a sample of 30% in each secondary school was used to obtain a total to 143 teachers in total. The study also used 16 chairpersons in the selected schools and also 16 head-prefects.

N= Total Population (51 schools)

Sample size = 30% *N (Mugenda & Mugenda ,2003)

= 30%*51 = 15.3 ~ 16 Secondary schools

= 30%*477 = 143.1 ~ 143 Teachers

Table 3.1 shows the sampled population.

Table 3.1

Sampled Population

	Secondary Schools	Public or Private	Principal	Teachers	Board Chair	Head-prefects/ captain	Total
	Boys' sec sch						
1.	Githongo boys' Sec Sch	Public	1	15	1	1	**18**
2.	Abothuguchi boys' Sec Sch	Public	1	14	1	1	**17**
3.	Katheri boys' High Sch	Public	1	12	1	1	**15**
4.	Keeru boys' Sec Sch	Public	1	11	1	1	**14**
5.	Nkando boys' Sec Sch	Public	1	7	1	1	**10**
6.	St. Martins Boys' sec sch	Private	1	5	1	1	**8**
	Girls' sec sch						
1.	Karugwa Girls' High	Public	1	12	1	1	**15**
2.	Kithirune girls' Sec Sch	Public	1	12	1	1	**15**
3.	Kirigara girls' Sec Sch	Public	1	10	1	1	**13**
4.	Ruiga girls' Sec Sch	Public	1	9	1	1	**12**
5.	Kinjo girls' Sec Sch	Public	1	11	1	1	**14**
6.	St. Theresa Riiji girls' Sec sch	Private	1	5	1	1	**8**
	Mixed day						
1.	Kithirune mixed Sch	Public	1	8	1	1	**11**
2.	Mukuune mixed Sch	Public	1	5	1	1	**8**
3.	Ruiga mixed Sec Sch	Public	1	5	1	1	**8**
4.	Mugambone day sec sch	Private	1	2	1	1	**5**
	Total		**16**	**143**	**16**	**16**	**191**

3.7 Data collection instruments

Data collection instrument was the way used to gather information from the respondent (Sileyew, 2019). This study utilized interview, questionaires and document analysis as data collection instruments. Interview method was used to collect data from the principals and board chairpersons (see appendix (III) while questionnaires were used to collect data from teachers and students (appendix IV). Document analysis was used to collect data from various sources such as school attendance register, schools rules and regulations manual, board meetings minutes and staff meetings minutes.

3.7.1 Interview guide

Interview method was used on principals and board chairpersons since first hand information they possesed was very crucial in underpinning the key objectives of the study. The interview guide had five sections as indictaed in appendix III. The first section A inquired on demographic information of the respondent. The second section B inquired on knowledge creation. The third section C inquired on the knowledge storage. The fourth section D inquired on the knowledge sharing. The fifth section E inquired on framework for implementing explicit knowledge management. The last section F had questions related to the dependent variable which was implementation of ICT explicit knowledge management framework.

3.7.2 Questionnaires

Questionnaires were a series of printed queries, designed for the purpose of a survey or statistical analysis, with a choice of responses (Sileyew, 2019). Implementation of self-administered questionnaire which had close-ended and open-ended questionnaires were used to gather data in this study as indicated in appendix IV. The closed ended questions

engaged 5 points tabular Likert scale questionnaire organized into six sections. The first section A inquired on demographic information of the respondent. The second section B inquired on knowledge creation. The third section C inquired on the knowledge storage. The fourth section D inquired on the knowledge sharing. The fifth section E inquired on ICT framework for implementing explicit knowledge management. The last section F had questions related to the dependent variable which was implementation of explicit knowledge management. The gaps identified from chapter two formed the basis of questions asked in the questionnaire.

3.7.3 Documents

The study analyzed general school reports such as school attendance register, schools rules and regulations manual, board meetings minutes, staff meetings minutes, teaching notes, school timetable, and curriculum documents for two year dated from 2018 to 2019. The study assessed scope, specificity, depth, data type and intended use (See appendix v).

3.8 Data collection procedures

The researcher began by first seeking authorization letter from Kenya Methodist University (KeMU). This authorization was acquired after proposal presentation in the school of science and technology. Thereafter, the study got NACOSTI research permit so as to be permitted to collect data in Meru central sub-county. Due to the fact that the study was collecting data from secondary schools, relevant authority was sought after from Meru County director of education (see appendix I). After attaining these approvals, the researcher recruited 3 research assistants to help during the data collection period. These three research assistants were hired based on their experience in data collection

procedure. They were trained and got briefs on the requirements and the nature of the study in a day.

On the material day of data collection, the research assistants first mapped out and visited the schools in proximity to the Meru central sub-county public offices area and thereafter proceeded to the ones far from the proximity. They moved as a group whereby as two of the research assistants were interviewing the principal, the other one was issuing and collecting data using questionnaires from sampled teachers and students. This enabled save time hence efficiency. They then moved to the next school and repeated the same procedure till all the 16 sampled schools were covered.

3.8.1 Interview data collection procedure

The research assistants visited the various sampled principals to interview them. A letter of introduction as indictaed in appendix (II) was issued to them once the research assistants introduced themselves to the principal. When the respondents agreed, they interviewed by asking questions. However, there was no media recording to avoid making interviewees unease during interview session. Therefore, information was recorded through writing down the responses in a notebook.

For interviewing board chairpersons, the research assistants requested the school principal to inform them on the easiest way of reaching them. The research assistants then availed themselves to interview the board chairpersons. After the interview, the researcher compiled the notes and stored them in a safe place awaiting further anlysis. All covid-19 health protocols were followed such as social distance, wearing of mask, sanitizing before and after meeting the respondents.

3.8.2 Procedure for administering questionnaires

The research assistants inquired from the secondary school administrator on how to identify and issue questionnaires to sampled teachers and students. Once they were identified, the research assistants introduced themselves and explained the need for the study. This was followed by research assistants issuing the introductory letter (see appendix (II). They afterwards gave them the questionnaires to fill in. Incase the respondents were absent at the time the research assistants were collecting data, they requested the administrator to direct them on how and where to find them. Once they had been explained, they would then either call them or proceed to meet with them so as to issue them with the questionnaires. Once all questionnaires were filled, the research assistants thanked the respondents and proceeded to store the answered questionnaires in a safe place awating data analysis.

3.8.3 Procedure for collecting data from documents

The research assistants requested the school principals whether they could access general school reports such as school attendance register, schools rules and regulations manual, board meetings minutes and staff meetings minutes. If permission was granted, the research assistants requested for two year reports dated from 2018 to 2019. The required information such as scope, specificity, depth, data type and intended use was noted on notebooks by the research assistants.

3.9 Pre-testing of research instruments

It was vital to pre-test the questionnaire beforehand to ascertain the reliability of the tools that would be used in the study (Bolarinwa, 2015). Pre-testing was done in Nkuene girls' secondary school, Nkubu high school and Ntharene day secondary school in Imenti

South Sub- County Meru. These schools had issues pertaining how they managed and updated their knowledge facilities such as libraries and computer software (MOE, 2014; Njoka, 2016). These secondary schools were selected using simple random sampling from other schools that were not included in the study and were located in Imenti South sub-county, Meru. These institutions were not in the same study site but were from a different site and had similar characteristics like the schools in the main study such as they were public and private secondary schools categorized as boys, girls and mixed schools. The main respondents were 1 principal, 1 teacher, 1 school board chairperson and 1 school head-prefect in each of the three secondary schools. In addition, this study tested explicit knowledge management system in a random sampled school in Meru County. It was put into use at Giaki secondary school and the results were noted.

3.9.1 Reliability

Reliability was the reliable fitness of a study's instrument's results when applied at a population (Taherdoost, 2016). It ensured that the results were unswerving when utilized over and over. To ensure that the questionnaire and interview was trustworthy consistently when applied to a comparable circumstance, the study conducted a pre-test as characterized in segment 3.8. Calculation of Cronbach alpha in characterizing the authenticity of the instruments as indicated by Taber (2018) was likewise applied. The answer recurrence ought to have at least Cronbach alpha consistent recurrence of 0.7 or above which communicated high reliability in research (Taber, 2018).

3.9.2 Validity

When data collection instrument performed its intended purpose effectively and reliably, it was referred to as validity (Ko et al., 2017). Diverse independent and dependent variables as covered in chapter two of this study formed the foundation for the

questionnaire's validity. Types of validity such as content, criterion and face validity were observed throughout the study (Ko et al., 2017). Content validity was observed by making sure that questions inquired are relatable to ICT tools in knowledge creation, storage, sharing and implementation of explicit knowledge management in secondary schools in Meru central sub-county (Ko et al., 2017). The prior literature facilitated to ensure that both the interview and questionnaire issued had done what was required to precision.

Criterion validity guided to test how well to do with the outcome of the study measure of the influence of ICT tools in knowledge creation, storage, sharing and implementation of explicit knowledge management in secondary schools in Meru central sub-county (Ko et al., 2017). This was observed when there was comparison of the pre-tests results with various similar studies that had ever dwelt on the variables of the current study. To achieve that, this study heavily consulted the already reviewed literature to identify the studies that have been talked about as the main constraints of the study. The questionnaire to be used maintained paradigm validity by guaranteeing that there were inquiries linked to ICT tools in knowledge creation, storage, sharing and implementation of explicit knowledge management in secondary schools in Meru central sub-county (Taherdoost, 2016).

3.10 Measurement of Variables

Variables were measured using questionnaires and interview guides as indicated on table 3.2.

Table 3.2:

Measurement of Variables

Independent variables	**Measurement**	**Scale**	**Instrumentation**
Knowledge creation	Likert Ordinal and interview questions	5-point Likert scale	Questionnaire and Interview
Knowledge storage	Likert Ordinal and interview questions	5-point Likert scale	Questionnaire and Interview
Knowledge sharing	Likert Ordinal and interview questions	5-point Likert scale	Questionnaire and Interview
ICT Framework for implementation of explicit knowledge	Likert Ordinal and interview questions	5-point Likert scale	Questionnaire and Interview
Dependent variable	**Measurement**	**Scale**	**Instrumentation**
ICT Explicit Knowledge management framework	Likert Ordinal and interview questions	5-point Likert scale	Questionnaire and Interview

3.11 Data Analysis and Presentation

The study gathered quantitative data in its line structure utilizing the typical assortment method. Gathered information was initially assessed for fulfillment and validity. This was cultivated by checking for incomplete survey bits by editing, at that point eliminating them from the remainder of the poll to lessen dubiousness in the examination henceforth cleaning the information. Whenever this was done, reasonable coding of information materials was finished by the use of SPSS version 25. On the qualitative data, the study

used text analysis method. The coding incorporated transmission of assorted information reactions with numbers to help during examination measure. The principal objective of coding was to lessen the enormous measure of data gathered through survey into an information base that could be essentially used in the investigation.

3.11.1 Analysis of Quantitative Data

Descriptive statistics was utilized to analyze the data in this study. The techniques that were used to analyze data was by the help of descriptive statistics which was mean, percentage and frequency. The findings were presented by using tables, thorough explanations that were also stressed on the inscribed texts.

3.11.2 Analysis of Interview Data

Thematic analysis was mainly utilised in analysis of interview data. This involved grouping the 16 responses from principals into thematic analysis technique. Once this was done, the study input the information in SPSS for report production.

3.11.3 Analysis of qualitative data from documents

Collected data from documents such as school attendance register, schools rules and regulations manual, board meetings minutes, staff meetings minutes, teaching notes, timetable, and curriculum document were analyzed through text analysis method. This method was convenient to slicing huge data so as to make short meaningful information. This study used organizational knowledge management framework which was developed by Andersen and APQC (1996).

3.12 Ethical considerations

The researcher began by first seeking authorization letter from Kenya Methodist University (KeMU). This authorization was acquired after proposal presentation in the

school of science and technology. Thereafter, the study got NACOSTI research permit so as to be permitted to collect data in Meru central sub-county. Due to the fact that the study was collecting data from secondary schools, relevant authority was sought from Meru County director of education. A letter of introduction as indictaed in appendix (II) was issued to all respondents when the researcher and research assistants introduced themselves. The respondent chose to take part or not in the study. If the respondents failed to accept, the researcher did not force them. Confidentiality was maintained throughout the study whereby the respondents were informed not to write their personal details such as names and contacts in the questionnaire.

Once all questionnaires and interview responses were filled, the research assistants thanked the respondents and proceeded to store the answered questionnaires in a safe place. In addition, all covid-19 health protocols were followed such as social distance, wearing of mask, sanitizing before and after leaving the principal's office. There was data integrity whereby data that was used for academic purposes would not be fabricated from the previously done studies. Acknowledgement of all sources of information was cited and referenced according to APA format.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

The chapter described various types of analysis done on the collected data followed the findings and discussion of the same. The chapter begins by presenting results on the reliability test, response rate, demographic information, and diagnostic tests. In addition, there was use of prototyping methodology to develop ICT based explicit knowledge management system. Thereafter, descriptive statistics results on the questionnaires have been provided followed by the research framework.

4.2 Reliability Test Results

Pre-testing was done in Nkuene girls' secondary school, Nkubu high school and Ntharene day secondary school in Imenti South Sub- County Meru. The main pre-test respondents were one principal, teacher, school board chairperson and school head-prefect/ captain in each of the three secondary schools. The study conducted pre-test interviews to the principals and school board chairpersons while the teachers and school prefects answered pre-test questionnaires. The results are indicated in Table 4.1.

Table 4.1

Reliability Results

Instrument	Cronbach's Alpha
Questionnaires	
ICT tools in knowledge creation	0.85
ICT tools in knowledge storage	0.93
ICT tools in knowledge sharing	0.84
ICT implementation framework	0.87
Managing explicit knowledge	0.82
Interviews	.797

The results in Table 4.1 show that the Cronbach Alpha values for the questionnaires which had ICT tools in knowledge creation, ICT tools in knowledge storage, ICT tools in knowledge sharing, ICT implementation framework and management of explicit knowledge had Cronbach alpha value of 0.85,0.93,0.84,0.87,0.82 respectively. The Cronbach alpha value for the interview instruments was 0.797. This indicated that the questionnaires and interview guides were reliable. The answer recurrence ought to have at least Cronbach alpha consistent recurrence of 0.7 or above which communicated high reliability in research (Taber, 2018).

4.3 Response rate

The study had sampled 16 principals, 16 school board chairpersons, 143 teachers and 16 school captains. A total of 32 respondents who were 16 principals and 16 board chairpersons were interviewed. Only, 14 principals and 10 board chairpersons were interviewed which totalled to 24(75%) response rate. One hundred and fifty-nine (159) respondents who were 143 teachers and 16 school captains were issued with the

questionnaires. However, 122 teachers and 16 head prefects/school captains answered the questionnaires totalling to 138(87%) response rate. These results show that there was an excellent response rate since Materko et al. (2015) stated that when the response rate was above 70% in a study, it was considered excellent.

4.4 Demographic information

The study made an effort to examine various background information on the respondents. The main concern on principals, board chairperson and teachers were to assess their academic qualifications and working experience in their current schools as indicated on table 4.2

Table 4.2

Demographic Information on Principals, Board Chairperson and Teachers

Academic Qualifications	Frequency	Percent	Cumulative Percent
PhD	2	1	1
Masters	17	12	13
Degree	56	38	51
Diploma	42	29	80
Certificate	29	20	100
Total	146	100	
Working experience	Frequency	Percent	Cumulative Percent
More than 10 years	21	14	14
8-10 years	27	18	32
6-8 years	19	13	45
4-6 years	22	15	60
2-4 years	25	17	77
1-2 years	20	14	91
Below 1 year	12	9	100
Total	146	100	

The results on Table 4.2 indicate that 56(38%) principals, school board chairpersons and teachers had a degree qualification. In addition, 42(29%) had diploma qualifications. However, only 2(1%) respondents had highest level of education which was PhD. These results indicate that the principals, board chairpersons and teachers were academically qualified to manage and implement explicit knowledge in their secondary schools. Further, the results indicate that the respondents understood various techniques of creating, storing and sharing knowledge using ICT tools. Additionally, the results show that the respondents had the academic capacity to develop and participate amicably in the process of implementing various frameworks within the scope of management of

explicit knowledge. In agreement with the results, Idhalama and Echedom (2021) stated that the level of teacher's academic qualifications played a significant role in enabling them raising awareness on knowledge sharing behavior among students in Nigerian secondary schools

As per working experience in their respective schools, 27(18%) had 8-10 years. However, only 12(9%) had less than 1 year. The results specify that principals, board chairpersons and teachers had stayed in their respective secondary schools for an extensive period of time to fathom how ICT tools in knowledge creation, knowledge storage, knowledge sharing and subsequent an ICT implementation framework works. Igbinovia and Osuchukwu (2018) ascertained that the more years library personnel worked, the more they were inclined in being agents of knowledge sharing and sustainable development goals. This was because they had internalized what works and what doesn't work and how the school systems work. This indicated that the number of years a staff has worked contributes towards ensuring knowledge management is effective.

A further examination was conducted to assess the number of years that school heads/captains had served in their respective school. The outcome is shown on Table 4.3.

Table 4.3

Demographic Information on School Heads/ Captains

Years in leadership	Frequency	Percent	Cumulative Percent
3-4 years	0	0	0
2-3 years	2	13	13
1-2 years	6	37	50
Below 1 year	8	50	100
Total	16	100	

Table 4.3 indicate that 8(50%) and 6(37%) of the school captains had served for a period of less than 1 year and between 1-2 years respectively. The outcome shows that the school management was keen on ensuring that school heads had a specified time limit to serve in their capacities so as to give chance to other students. The results indicate that once school captains were given a period of one to two years, it gave a chance for various potential schools' heads to learn a lot on ICT tools used in creating knowledge such as socialization and externalization. Additionally, a huge number of students elected as schools' heads had the opportunity on learning how ICT could be used to store knowledge such as through reports, books and documents. The school heads had enough time to learn on various knowledge sharing methods such as having meaningful conversation with teachers and students, preparing for meetings and workshops. According to Jensen (2017), rotation in leadership positions among students enabled them get identified and develop their leadership skills on time. The onset of this process was one sure way of enhancing coping skills on leadership challenges by students and creative methods of finding solutions to these challenges.

4.5 Descriptive Statistics on Implementation of Explicit Knowledge Management

Implementation of explicit knowledge management was the dependent variable in this study. It had indicators such as manuals management, documents management, policies and knowledge management systems. The study had three ways of collecting data on this variable. The study used questionnaires, interview method and document analysis. The questionnaire was closed-ended and had various statements that the respondents were supposed to tick a choice on the following: 1 = strongly disagree, 2 = Disagree, 3= neutral, 4= agree and 5 = strongly agree as indicated by Table 4.4.

Table 4.4

Descriptive Statistics of Implementation of Explicit Knowledge Management

Statements N=138	1	2	3	4	5	Mean
E-learning in knowledge creation have improved explicit knowledge	73(53%)	58(42%)	0(0%)	7(5%)	0(0%)	2.02
E-libraries in knowledge storage have improved explicit knowledge	2(1%)	28(20%)	0(0%)	69(51%)	39(28%)	3.80
Knowledge sharing tools such as g-mail and zoom have improved explicit knowledge	2(1%)	2(1%)	0(0%)	14(10%)	120(88%)	4.78
Reliable framework has improved explicit knowledge	10(8%)	50(36%)	3(2%)	72(52%)	3(2%)	3.05
School values supports knowledge management	7(5%)	56(41%)	0(0%)	70(51%)	5(3%)	3.07
Management of knowledge methods are well known	3(1%)	3(1%)	0(0%)	37(28%)	95(70%)	4.61

As indicated on Table 4.4, out of the 138 teachers and students who answered the questionnaires, 14 (10%) agreed and 120(88%) strongly agreed on a mean of 4.78 that ICT tools in knowledge sharing such as g-mail, zoom and google meet had improved explicit knowledge management in their school. That notwithstanding, the same respondents did not highly tally as compared to other statements that ICT tools such as e-learning systems in knowledge creation had improved explicit knowledge management

in their school. Seventy-three (53%) strongly disagreed and 58(42%) disagreed hence a low mean of 2.02.

This implied that e-learning was not yet fully operational in secondary schools in Meru central sub-county. There were still major set-backs that hampered secondary schools to fully use e-learning systems towards disseminating explicit knowledge. Maisamari et al. (2018) also established similar results whereby they provided evidence that Nigerian's secondary school teachers had not yet familiarized themselves with the ICT systems and operations. This resulted to a halt on new ways of teaching that required them to orient students on online teaching. Maisamari et al. (2018) stated that inadequate use of ICT was the main cause for this resistance to change by the teachers.

The study made efforts to interview principals and school board chairpersons. The study allocated them numerical codes beginning from respondent '1-24' to hide their identity. The first question required them to explain how the school ensured that users' enthusiasm was maintained when using ICT tools. They answered by saying that there was an established computer department where users such as students received free computer classes and there were qualified computer teachers. In South Africa, Ojo and Adu (2018) pointed out that high school students learnt more through use of ICT when computers were readily available and a computer teacher presence to guide them on what to do in case, they were stuck. Additionally, Opeke et al. (2020) acknowledged that computer classes were a motivating factor towards knowing how to share information by Nigerian secondary school students who were preparing for their STEM career paths. Respondent 13 was quoted saying,

> *''Our institution has made efforts to create students and staff emails through the computer department. These emails are used to send and receive documents such*

as assignments, personal emails, exam results, fees statements, and any other academic related materials''.

The second question required them to state ways into which the school equipped regarding proper document management as a way to attain the school's vision. While answering the question, respondent 7 stated,

''We have created a school website that has one stop services such as having knowledge portals of e-past papers. This enables students avoid much paper work and can easily filter the relevant exams as they prepare for their examinations''.

Other respondents cohesively indicated that there was a school staff given the responsibility to manage documents. In addition, there was an aerated store established to keep different documents; and that there was presence of document issuance log-book that required users of the document to fill in their details for accounting purposes. The study by Odeniyi and Adeyanju (2020) concurred that proper records management was a simple task that could be practiced in areas such as stores whereby a responsible staff would be in charge on what comes in and what goes out as far as documents are concerned.

The third question required them to elaborate the frequency of training of teaching staff on manual management. The respondents gave different timelines but the major timelines given were semi-annually and annually. This was because many schools felt that it would give both parties (the teachers and management) time to go through and apply the skills towards management of manuals over a substantive period of time. Yoo et al. (2020) also found out similar results whereby the study examined how Korean and American schools practice transformational leadership in the knowledge creation process. According to

Yoo et al. (2020), when schools valued their teaching and non-teaching staff, they provided retreats, trainings, workshops, and seminars to equip them with leadership skills so as to offer well thought direction to students who relied upon them for scholarly excellence.

The fourth question required them to explain the various sources of the funds used to equip ICT department. The respondents named the MOE, sponsors, donors, parents, alumnae, community and well-wishers. Zhang et al. (2020) also established that China education emergency management relied on China's education ministry, sponsors and donors to fund various public institutions such as secondary schools on equipping their ICT infrastructure. This helped a lot in facilitating smooth online classes during covid-19 pandemic placing China among global nations that led in supporting their education system even during a pandemic.

The fifth question required them to mention the procedures used to monitor and evaluate the school's ICT systems. The steps were majorly on four areas which were: Identifying the intended goal of the system, examining the achieved goals, realizing the unachieved goals and the challenges faced, providing solutions to the challenges so as to achieve both short-term and long-term goals.

The study also perused various school reports such as school attendance monthly register, school rules and regulations manual, board meetings minutes, staff meetings minutes, teaching, notes, school timetable, and curriculum documents. Table 4.5 gives the results gotten from the reports.

Table 4.5

Descriptive Statistics of School Reports

Secondary Schools	Year	Scope	Specificity	Depth	Type of data	Purpose
School attendance monthly register	2018/ 2019	Students	Number of days present in school	Monthly	Numerical	School attendance
School rules and regulations manual	2018/ 2019	Student, teachers	Behavior, relationship between students	Annually	Natural language description	Provide an orderly knowledge environment
Board meetings minutes	2018/ 2019	Senior Manage ment	Strategic plan, funds management, on school ICT projects.	Per term	Natural language description	Institutional progress
Staff meetings minutes	2018/ 2019	teachers, principal	Academic performance, discipline, teachers' welfare.	Weekly, monthly and per term	Natural language description	Assess the general wellbeing of knowledge levels
Teaching Notes	2018/ 2019	teachers and students	ICT lesson plan, syllabus coverage, examinations	Semi-annually and annually	Natural language description	Course content as guided by the MOE
School time Table	2018/ 2019	teachers, students, and other staff	ICT lesson distribution, school activities	Per term	Natural language description	Improve awareness on time management
Curriculu m documents	2018/ 2019	manage ment, teachers, students and parents	Syllabus coverage, resource allocation and timeframe	Annually	Natural language description	Provide a national ICT learning foundation for students in schools

According to Table 4.5, school attendance monthly registers inspected for the year 2018 and 2019 were mainly meant for the students. It provided numerical information on the number of days a student has been present in the school on a monthly basis so as to get access to explicit knowledge already in place. The information was mainly numerical in nature. In addition, rules and regulations manuals dated 2018 and 2019 were examined. There were mainly set up to provide among other reasons an orderly knowledge focused environment to both students and teachers.

The rules and regulations manuals were reviewed annually and focused on the behavior and how parties in school relate with each other when accessing explicit knowledge. Further on, the minutes of board meeting reports assessed for the period 2018 and 2019 were mainly meant for the senior management. The reports were as a result of meetings held per term. Rules and regulation manuals documented using natural language description and were purposed for strategic plans on implementation of explicit knowledge, funds management for school's ICT projects.

The researcher investigated further on staff meetings minutes dated 2018 and 2019. These minutes had a purpose of indicating the level of knowledge management processes such as storage avenue utilization in school by teachers and principals within a period of time. For example, staff meetings provided a chance for teachers to give account on various reports on their classes, trainings planned and learning lessons conducted among others. The meetings were grouped weekly, monthly and per term. Knowledge management was critical in assessing academic performance, discipline, teachers' welfare since they were the key disseminators and guide to explicit knowledge in a secondary school set-up. The study evaluated further the teaching notes that were provided by the school and centrally placed as point of reference to teachers dated 2018

and 2019. These notes were meant for teachers and students. They provided course content as guided by MOE. The content was broken down to lesson plans, syllabus coverage and examinations on the level of understanding by students on explicit knowledge. School time tables were also reviewed as dated on 2018 and 2019.

The time tables were meant for teachers, students and other staff to enhance their awareness on time management. The timetables had specifically ICT lessons distribution across the classes for students who took computer classes and other school activities. The last report to be explored was the curriculum documents dated 2018 and 2019. These documents were meant for the management, teachers, students and parents. They involved syllabus coverage, resource allocation and timeframe for ensuring explicit knowledge was expounded to the students. This provided a national ICT learning foundation for students in Meru central sub-county secondary schools with annual reviews from MOE officials.

In relation to knowledge-based theory, once teachers and students got an identity through use of ICT systems in knowledge management, they became more fulfilled. Additionally, more satisfaction was derived hence preparing them on achieving the set targets such as passing of exams and delivering of quality teaching for students and teachers respectively.

4.6 Descriptive Statistics of ICT Tools in Knowledge Creation for Managing Explicit Knowledge

ICT tools in knowledge creation was one of the independent variables in this study. It had indicators such as socialization, externalization, combination and internalization. The study used questionnaires and interview method. The questionnaire was closed ended and had various statements that the respondents were supposed to tick a choice on

the following: 1 = strongly disagree, 2 = Disagree, 3= neutral, 4= agree and 5 = strongly agree as indicated by Table 4.6.

Table 4.6

Descriptive Statistics of ICT Tools in Knowledge Creation for Managing Explicit Knowledge

Statements N=138	1	2	3	4	5	Mean
Quality knowledge practices through ICT tools	0(0%)	61(44%)	0(0%)	77(56%)	0(0%)	3.12
Presence of department to assess created knowledge	7(5%)	56(41%)	0(0%)	70(51%)	5(3%)	3.07
Availability of internet has boosted knowledge creation	53(39%)	27(21%)	19(14%)	18(13%)	21(15%)	2.46
Social media and website have improved learning process	55(40%)	27(20%)	14(10%)	22(16%)	19(14%)	2.45
Frequency of training on coping with academic knowledge creation	11(8%)	54(39%)	0(0%)	72(52%)	1(1%)	2.99
There is STEM systems to help students participate in knowledge creation	6(4%)	58(42%)	0(0%)	74(54%)	0(0%)	3.02

As indicated in Table 4.6, the respondents majorly on a mean of 3.12 agreed that their schools had quality knowledge creation practices through ICT tools. In addition, they

also confirmed on a mean of 3.07 that there were departments responsible for assessing the created knowledge utilized in the school through ICT tools. On the contrary, the respondents did not agree that there had been use of social media platforms and website to improve learning process in their school and also availability of internet in their schools had greatly influenced knowledge creation (mean 2.45 and 2.46 respectively).

It could thus be interpreted that most secondary schools did not have internet connection and in case they had it, it was not reliable. This made it hard for the school management to use internet related application such as social media platforms and working websites in their learning process. Teaching and non-teaching staffs relied on personal data plans to connect on internet since it was more convenient and available for use. Therefore, at a more communal level, it was expensive to create a hotspot through a mobile device for students to access and use the internet. Asterhan and Bouton (2017) also found out that lack of internet connection was a major limitation that made secondary schools teenagers not able to create and share knowledge through social media sites.

The study made efforts to interview principals and school board chairpersons. The study allocated them numerical codes beginning from respondent '1-24' to hide their identity. The first question required them to state whether the school had any internet connection. The responses showed a divided opinion. The respondents affiliated with private secondary schools indicated that there was internet connection but their counterparts complained of few or no internet connection. Respondent 2 was quoted saying that,

> *''We have made countless appeals with no positive feedback to the concerned officials to install internet facilities so as to enable the students undertaking computer studies. All we can do is wait and hope they will install it in future''.*

Respondent 22 was quoted saying that,

> *''Yes, there is internet connection in this school. However, we have limited it to the management only since we noticed when teachers and students were allowed to use it, they abused the opportunity''.*

Carter and Istenic (2018) also established that the innovative technologies in learning particularly at high school set-up was greatly advocated on how easily they could access social media and other online platforms.

The second question required them to explain whether the school had any e-learning systems. The principals and chairpersons explained that they did not currently possess any e-learning systems but relied on third parties to offer the services. The current e-learning systems that the secondary schools were using included e-Kitabu, Eneza education, and eLimu center. Respondent 7 said that,

> *''At our level, we don't have enough resources to fund customized e-learning systems. We have partnered with a firm that manages diverse e-learning systems hence adopt a system that has the approved curriculum content for our students.''*

In agreement with the results, Mastercard Foundation (MF, 2020) reported that Kenya's e-Kitabu, Eneza education, M-shule Kenya and Litemore as part of 12 African Ed Tech firms offering e-learning resources to secondary school students. The third question required them to elaborate what ICT ways the teachers used to create knowledge. The respondents indicated that the use of projection of power point slides, academic related videos through school television screens, emails and telephone calls.

The fourth question required them to highlight whether there had been any ICT training/workshop/seminar in the last three years. The respondents confirmed that ICT training was dormant before the spike of covid-19 rates in Kenya, however after that

period, ICT training has been done frequently with some of the schools holding it quarterly. The majority of schools according to the respondents held the trainings either once or twice in the year 2020 and 2021 respectively. In agreement, Chepkorir and Kandiri (2018) had a similar complain that Mombasa County secondary schools were not able to effectively integrate ICT due to irregular trainings offered. In a more recent work by Idhalama and Echedom (2021) they claim that post-corona era has changed things. More attention is now paid to ICT trainings due to increase in demand for ICT systems in secondary schools not only in Nigeria but all over the world.

The last question required them to describe how training had influenced proper creation of knowledge in the school. They indicated that training had exposed to them on simpler ways of knowledge creation such as through WhatsApp groups; trainings had sharpened their skills since they had a chance to ask questions that were not familiar with them; and they got an opportunity to learn from other people on how they handled various challenges faced during knowledge creation. Respondent 14 said that,

> *''It gives the staff the exposure they need through learning new trends on ICT and also through interactions with other people in the training''.*

Konig et al. (2020) indicated that one factor that caused Germany teachers adopt to online teaching was due to improved efficiency. The efficiency was as a result of consistent e-trainings they were given especially during covid-19 period. According to Konig et al. (2020), teachers were able to gain ICT education and sharpen each others skills gotten during the trainings.

The study had a question that required an explanation by the principals and board chairpersons on how ICT tools influenced knowledge creation in management of explicit

knowledge in secondary schools in Meru central sub county. It was established that ICT tools provide utilities to process information created at a faster pace; they ensure created knowledge is filtered from other types of information for quick decision making; they provide support services on how to analyze created knowledge precisely; and enable suitable storage of knowledge.

Further, linking the results to knowledge-based theory, it has become clear that through creating knowledge in schools, the school fraternity is able to acquire skills through diverse ways such as allowing them to learn various society norms and values as it allows them to express their ideas to other people. This would further develop how the management, teachers and students interact with each other in the learning process. It is through these relations that constructive knowledge would be created in the school for present and future use.

4.7 Descriptive Statistics of ICT Tools in Knowledge Storage for Managing Explicit Knowledge

ICT tools in Knowledge storage was one of the independent variables in this study. It had indicators such as reports, database, books and documents. The study used questionnaires and interview method. The questionnaire was closed ended and had various statements that the respondents were supposed to tick a choice on the following: 1 = strongly disagree, 2 = Disagree, 3= neutral, 4= agree and 5 = strongly agree as indicated by Table 4.7.

Table 4.7

Descriptive Statistics of ICT Tools in Knowledge Storage for Managing Explicit Knowledge

Statements N=138	1	2	3	4	5	Mean
ICT tools in school archives	77(56%)	50(36%)	0(0%)	0(0%)	11(8%)	2.35
Incorporation of ICT tools to store data	0(0%)	29(21%)	0(0%)	70(51%)	39(28%)	3.87
Authorized personnel to access stores	0(0%)	17(12%)	0(0%)	70(51%)	51(37%)	4.12
Students' accessibility to computers	0(0%)	11(8%)	0(0%)	70(51%)	58(41%)	4.26
Competitive advantage due to reliable systems	0(0%)	2(1%)	0(0%)	70(51%)	66(49%)	4.44
Periodic review on efficiency of knowledge storage facilities	70(51%)	37(27%)	29(21%)	2(1%)	0(0%)	2.87
Qualified personnel to manage school's database	0(0%)	0(0%)	0(0%)	44(32%)	94(68%)	3.88

As indicated in Table 4.7, the respondents agreed that there had been competitive advantage in their secondary schools due to reliable knowledge management practices like libraries for effective storage (mean 4.44). In addition, the respondents also agreed that students had accessibility to computers which enabled them to store notes and reading materials. However, they did not come to an agreement that there had been improved ICT tools put into place in their school archives to facilitate storage, retrieval

of files and books conveniently (mean 2.35). In addition, they also did not come to an agreement that there was an ICT tools periodic review on the efficiency of knowledge storage facilities such as reports, books and documents in the school (mean 2.87).

This indicated that there was still a bone to chew as far as knowledge storage was concerned. The schools had completely not taken serious interest in ensuring knowledge was stored in the correct manner through key storage units required. It could not be linked to availability of resources since there was no will to even have timely appraisal on the effectiveness of the current methods and what needed to be done. If it was as a result of a resource like money, there would evidence of periodic appraisals on their methods which would definitely have resulted to brain storming on alternatives. As far as this study is concerned, lack of interest was mainly due to low awareness and poor training on the relevance of effective knowledge storage techniques towards explicit knowledge management in secondary schools in Meru County.

UNESCO (2019) also established that it was not just enough to provide digital learning through mobile devices but also ensure that there were adequate training and means of storing this knowledge in Rwandan education system. According to UNESCO (2019), when you do not know how to store knowledge, it leads to high costs on maintaining any knowledge since any time this knowledge is needed, it either has to be created freshly or incur expenses in accessing it from different external sources.

The study made efforts to interview principals and school board chairpersons. The study allocated them numerical codes beginning from respondent '1-24' to hide their identity. The first question required them to clarify how their schools archive various information through ICT tools. The respondent indicated that they mainly used emails to store documents and social media platforms such as Facebook updates and posts to store

images. In addition, they also used personal computers or printed the information in documents which were stored in a book store. Respondent 9 was quoted indicating that,

> *''We have been using emails to store information''.*

The interviewer inquired further on how it works. The same respondent 9 added that,

> *''You just need to upload the document to the g-mail, then send the document. For example board meetings minutes. You will have a copy of information stored safely in a place where it requires a password to access it.''.*

Respondent 2 said that,

> *''We use Facebook platform to store our photos. Once you post a photo today on Facebook, it will stay there without compromising on its quality nor computers storage space for many years.*

According to Thang (2020), organizations' strategies need to involve innovative knowledge management strategies that are customized to minimize on cost, efficiency and effectiveness when retrieving knowledge in future. The whole idea about managing knowledge is to ensure that quality is not compromised when it will be required at a later date.

The second question required them to elaborate the ways through which the school management incorporated information systems in management of staff. The responses ranged from having to submit daily work reports into the school' email to indicate the work done at a particular day. Additionally, another way included applying for their annual, medical or personal leaves online directly into the employer system whereby upon approval by the principal, they proceed. Further, filling the students' academic

results into the system for purposes of sending the same information to guardians was another way. Lastly, it enabled the school have a reliable system to communicate on important sensitive issues. Silva and Lima (2017) generalized the purposes of information systems in Human Resource Management [HRM] to processes in communication from and to the management by staff and filling work reports.

The third question required them to explain how students and staff are able to store knowledge through ICT tools in the school. The respondents said that there were school computers, personal mobile phones and tablets. The fourth question required them to highlight some of the challenges facing students and staffs as they perform the storage tasks using ICT tools. The respondents highlighted challenges such as low computer skills, lost passwords, poor way of naming stored files, mixing of files whereby there is storing the wrong file; cumbersome process hence demotivating them; lack of reliable internet to retrieve or upload documents; and poor time management whereby a lot of time is wasted when one wants to retrieve a document from the storage and does not know how to find it. Respondent 24 was quoted saying that,

> *''ICT is good but has its share of problems. Nowadays, everything related to ICT requires password due to cyber security issues. You will find, you have many passwords till you cannot recall which password was needed''.*

Raudeliūnienė et al. (2020) found out that unreliable internet, low computer skills and poor storage skills as some of the reasons why schools were finding it hard to effectively practice knowledge management.

The fifth question required them to describe the influence of knowledge storage ICT tools on implementation of explicit knowledge management. The principals and chairpersons

indicated that using ICT tools to store school information ensure that the quality is not compromised, time is saved unlike traditional methods where you have to manually store the documents, accessibility is restricted to authorized personnel, and information is available when needed even past working hours. Oktarina et al. (2020) argued that incorporation of ICT in managing school archives was one sure way of improving its effectiveness in the industrial revolution period. This being due to efficacies in time management when storing and retrieving documents.

The study had a question that required an explanation from principals and board chairpersons given on how ICT tools influenced knowledge storage in management of explicit knowledge in secondary schools in Meru central sub county. It was established that ICT tools facilitate gathering of information and distributing on the same to users in short duration of time. In addition, there is coordination of storage operations since there is less interference with stored knowledge which is limited to authorized people.

Further, in linking the results to unified theory of acceptance and use of technology, it would be prudent to state that the success of ICT tools in knowledge storage ought to be accepted and frequently used in the normal operations. This will see to it that it has become successful where the management, teachers and students have come to terms that various adopted knowledge storage techniques are effective in managing knowledge. It is until this happens that it could be concluded that a school has opted to use certain knowledge storage method.

4.8 Descriptive Statistics of ICT Tools in Knowledge Sharing for Managing Explicit Knowledge

ICT tools in knowledge sharing was one of the independent variables in this study. It had indicators such as conversations, meetings, learning sessions, workshops and seminars. The study used questionnaires and interview method. The questionnaire was closed ended and had various statements that the respondents were supposed to tick a choice on the following: 1 = strongly disagree, 2 = Disagree, 3= neutral, 4= agree and 5 = strongly agree as indicated by Table 4.8.

Table 4.8

Descriptive Statistics of ICT Tools in Knowledge Sharing for Managing Explicit Knowledge

Statements N=138	1	2	3	4	5	Mean
Emails have enabled teachers and student communicate	0(0%)	0(0%)	0(0%)	44(32%)	94(68%)	4.68
Students share knowledge through social networks	44(32%)	92(66%)	0(0%)	1(1%)	1(1%)	2.04
Management has been sharing knowledge to teachers through seminars etc.	0(0%)	0(0%)	0(0%)	38(27%)	100(73%)	4.73
ICT tools such as g-mails have boosted sharing awareness	2(1%)	2(1%)	0(0%)	27(20%)	107(77%)	4.68
Improvement of academic performance due to access of shared knowledge	2(1%)	2(1%)	0(0%)	37(27%)	97(71%)	4.61
Support from the government to increase innovation	2(1%)	2(1%)	0(0%)	13(11%)	120(87%)	4.78

As indicated in Table 4.8, the respondents agreed that the government has been offering financial support to boost and increase innovation on knowledge sharing through ICT tools (mean 4.78). Additionally, they also agreed that the management has been sharing knowledge to teachers through training plans, workshops, seminars, direct talks and work-based studies (mean 4.73). However, they did not come to an agreement that the

students were encouraged to share knowledge amongst themselves through social networks (mean 2.04). This was because the students did not understand the relevance of sharing knowledge in the first place.

There was so much focus in their schools of improving their grades and academic performance so as to get university entry points. This focus was so much monopolistic to a point that students missed out on mire important aspects in life such as sharing what they know with others through social networks. In fact, what they did on social networks was more of posting photos and visiting social media influencers' pages. An observation made by Carter and Istenic (2018) indicated that students have never been sensitized on how they could use social media to their advantage. Thus, leading to abuse of social media platforms when they get a chance. As a result, most secondary school environments discourage its use in the learning process.

The study made efforts to interview principals and school board chairpersons. The study allocated them numerical codes beginning from respondent '1-24' to hide their identity. The first question required them to elaborate how their secondary schools have been sharing knowledge through ICT tools during the covid-19 pandemic. They indicated that they mainly relied on emails, local radios, phone calls, text messages, WhatsApp groups and Facebook pages. According to Khamali and Thairu (2018), when there was an increased awareness among lecturers on various knowledge sharing alternatives in ICT, behavior of the students was significantly influenced. This was because students felt a connection and generally curious on the contents of shared knowledge in their most preferable platform. For example, the students would be more excited if the lecturers sent assignments through emails rather than making them carry countless paper work on the same assignment.

The second question required them to explain various forms of passing information used in this school. They included teaching, talking/ conversation, writing, posters, television/ radio adverts, poems, photos, singing, and preaching. The third question required them to mention various approaches that the management takes when sharing knowledge using ICT tools with external stakeholders of the school. This included projection, screen sharing, WhatsApp and Facebook posts, and telephone calls, text messages, updating websites, and printed out document. Kipkosgei et al. (2020) indicated that the choice of method of sharing knowledge was based on its ability to cultivate trust amongst the receivers. The methods named by Kipkosgei et al. (2020) included conversation, writing and social media platforms.

The fourth question required them to name the challenges the schools faced when knowledge sharing using ICT tools in the school was not present. These challenges were lost opportunities, increased costs, poor interpretation, unawareness on the content of the knowledge intended to be shared, and loss of precious time. Gillman et al. (2020) also found out that when knowledge was not managed well such as not sharing relevant information to the required parties, projects tended to be more costly since there was no central interpretation on what to do. This resulted to errors and inconsistency in delivering agreed results on time.

The fourth question required them to name the contributions made by the government pertaining ICT tools installation in this school. The contributions included donation of computers and other ICT peripherals, increase in resources allocation such as money; employment of more computer teachers under the Teachers Service Commission [TSC], and supply of cabled internet under the ministry of communication. CAK (2020) indicated that the government of Kenya had made efforts to ensure public secondary

schools were equipped with cable connection to boost their education broadband. In addition, the package came with budgetary allocation to these schools to facilitate full installation.

The study had a question that required an explanation given by principals and board chairpersons on how ICT tools influenced knowledge sharing in management of explicit knowledge in secondary schools in Meru central sub county. It was established that ICT tools reduced time wasted when sharing knowledge, improved awareness and enhanced accountability of actions resulting from the shared knowledge.

Further, in linking the study to unified theory of acceptance and use of technology, various knowledge sharing methods are highly related to whether the users have accepted it or not. On the one hand, teachers' use and acceptance of ICT tools such as google meet will determine whether or not they will use in setting up meetings, workshops, seminars or learning sessions. On the other hand, students' acceptance level of use of a system such as intranet in making learning related conversation. If they have not accepted it, they will hardly use it when making conversations.

4.9 Descriptive Statistics of ICT implementation framework for Managing Explicit Knowledge

ICT implementation framework was one of the independent variables in this study. The study used questionnaires and interview method. The questionnaire was closed ended and had various statements that the respondents were supposed to tick a choice on the following: 1 = strongly disagree, 2 = Disagree, 3= neutral, 4= agree and 5 = strongly agree as indicated by Table 4.9.

Table 4.9

Descriptive Statistics of ICT Implementation Framework for Managing Explicit

Statements N=138	1	2	3	4	5	Mean
Policies on student's accessibility to knowledge	15(11%)	63(46%)	0(0%)	60(43%)	0(0%)	2.76
Staff participation in implementation of knowledge frameworks	11(8%)	56(41%)	1(1%)	64(46%)	6(3%)	2.99
School board and management have procedures to develop knowledge frameworks	55(40%)	27(20%)	21(16%)	15(11%)	20(13%)	2.40
Periodic review of frameworks	53(38%)	27(20%)	19(14%)	22(17%)	17(11%)	2.45
Conducive environment to promote knowledge	14(10%)	57(41%)	7(5%)	56(40%)	4(4%)	2.85
Review of ICT processes	10(7%)	50(37%)	3(2%)	73(53%)	2(1%)	3.05

As indicated in Table 4.9, the respondents confirmed that there was a periodic review on the current framework processes, structure, and ICT (mean 3.05). Nevertheless, they did not come to an agreement that the school board and senior school staff had a clear formality on how to develop and implement policies on explicit knowledge such as the one affecting teaching and learning (mean of 2.4). They also disagreed that there was a review on frameworks normally done periodically to assess whether the frameworks were working (mean 2.45).

What this meant was that, there were neither policies nor guidelines on how to develop, implement and review frameworks in the secondary schools. This made it hard for the senior management to provide direction on what to do since every one of the team had their way of how they wanted it done. This resulted to disagreements and conflicts that made the frameworks get suspended for long without solutions on how to go about them. OECD (2020) noticed with a lot of concern that many developing nations' education systems did not have procedures to develop frameworks in respective institution. This resulted to crude biased ways of developing frameworks based on what one gains from it.

The study made efforts to interview principals and school board chairpersons. The study allocated them numerical codes beginning from respondent '1-24' to hide their identity. The first question required them to explain whether their schools had any ICT policy or guidelines on ICT usage. Most of the schools were in the process of developing these policies. According to the principals and board chairpersons, covid-19 pandemic had created a demand to come up with policies on how to effectively implement ICT usage in the schools. In relation to this respondent 11 was quoted saying that,

> *''Not once or twice have we forwarded the proposed policies to the ministry of education. The response they give us is that we should rectify various policies to be in line with the constitution hence causing all these delays''.*

Ronoh et al. (2020) also complained that bureaucracy in the process on implementing policies and frameworks in ICT, discipline and performance evaluation was the main cause of derailed attainment of vision 2030 in the Kenyan education sector.

The second question required them to elaborate ways that availability of ICT tools such as g-mail, zoom and e-learning systems had improved knowledge management activities. These ways included reduction of time wasted in printing documents, setting up for meeting venues, and approving budgets for food and drinks to be used in meetings.

The third question required them to describe the developments made on the curriculum system of secondary schools through use of ICT tools. These developments were focused on learner-centered whereby the teachers offer basic ICT skills to students; students were encouraged through being given platforms such as science congress to develop Apps that are beneficial to the society; improvement on online registration of KNEC exams; employment, promotion and transfer of teachers is nowadays done online. In South Africa, Mkhongi and Musakwa (2020) discovered that incorporating ICT in GIS education in the secondary school resulted to critical thinking by students to a point of providing ICT generated solutions applicable to the society.

The fourth questions required them to name some of the knowledge frameworks put into place towards combating covid-19 pandemic in this secondary school. These knowledge frameworks include procedures for washing hands, procedures for routine disinfection and fumigation of the school; protocols to follow when a covid-19 case has been suspected; and procedures on students' covid-19 management whereby there are protocols to take daily basis. The fifth questions required them to highlight causes of implementation lags on frameworks developed. The study noticed lack of enough resources, lack of trained personnel, lack of management support, and poor motivation from the staff.

The study had a question that required an explanation given by principals and board chairpersons on the suitability of ICT implementation framework for explicit knowledge

management in secondary schools in Meru County. It was established that ICT tools reduced time wasted when sharing knowledge, improved awareness and enhanced accountability of actions resulting from the shared knowledge. If students are able to access reading materials through ICT, it becomes easier for the teachers to plan for their lessons; and accessibility of e-notes and e-exams provided to the students had enabled the school management save on costs incurred on paper work costs.

Further in linking organization learning theory to ICT implementation framework for Managing Explicit Knowledge, it is factual to indicate that continuous learning part of the system users is important. This is because technology changes rapidly and so should learning be. Implementation of various ICT frameworks requires the users to have assimilated a substantive knowledge on how, where and when to use the framework in their daily operations. Therefore, the secondary school fraternity encourages continuous learning to management, teachers and students so as to be par with technological implementation in form of ICT framework.

4.10 ICT Knowledge Management System Prototype

In developing ICT knowledge management system prototype, the study first investigated various structures of e-learning systems that existed through the help of internet. This involved paying keen attention on various knowledge portals, digital libraries and data warehouses. Other patterns observed on e-learning systems were reports, books and documents submitted through the e-learning systems. Once this was done, special attention was paid on conferencing ICT tools such as google meet, zoom, and emails to identify patterns on socialization, externalization and internalization knowledge creation processes involved. Additionally, there was further investigations on how these patterns

made conversations, meetings, learning sessions, workshops and seminars better. The investigations made enabled the study come up with a prototype which was similar to e-learning systems developed with features such as login details, knowledge creating, storage and sharing portals.

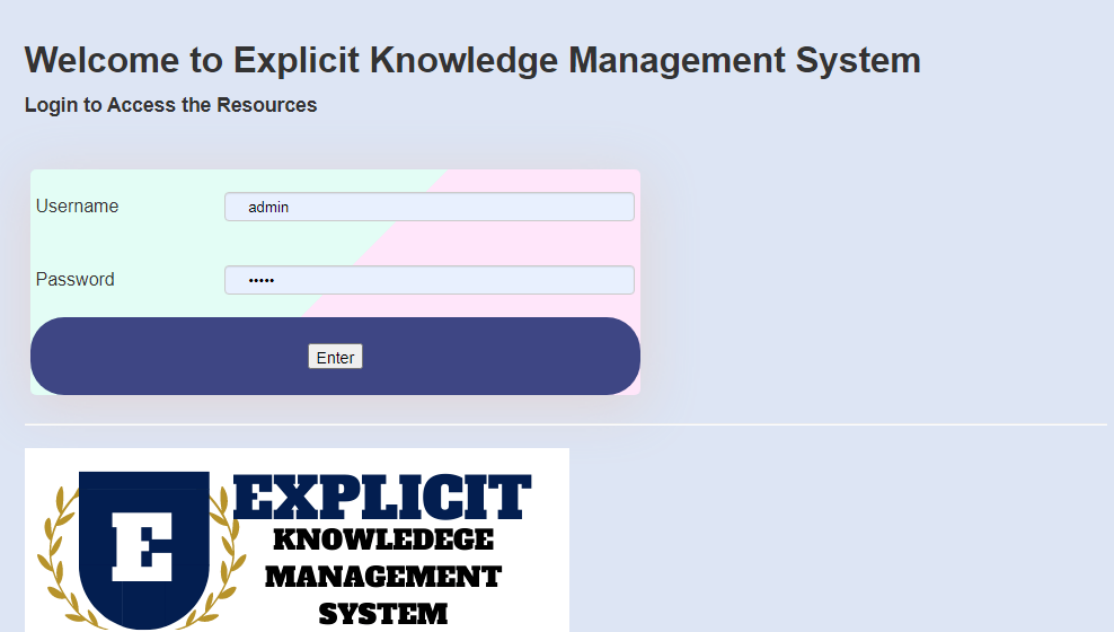
This study later tested the explicit knowledge management system in a simple random sampled school in Meru County. It was put into use at Giaki secondary school and the results were noted. Some of the keen areas of interest in the system development were based on three modules which were knowledge creation, knowledge storage and knowledge sharing modules. The system prototype developed is provided under figure 4.1 to Figure 4.6.

4.9.1 Knowledge Creation

Knowledge was created using the developed system in this study. There are various figures used to demonstrate the knowledge creation process.

Figure 4.1

Home page

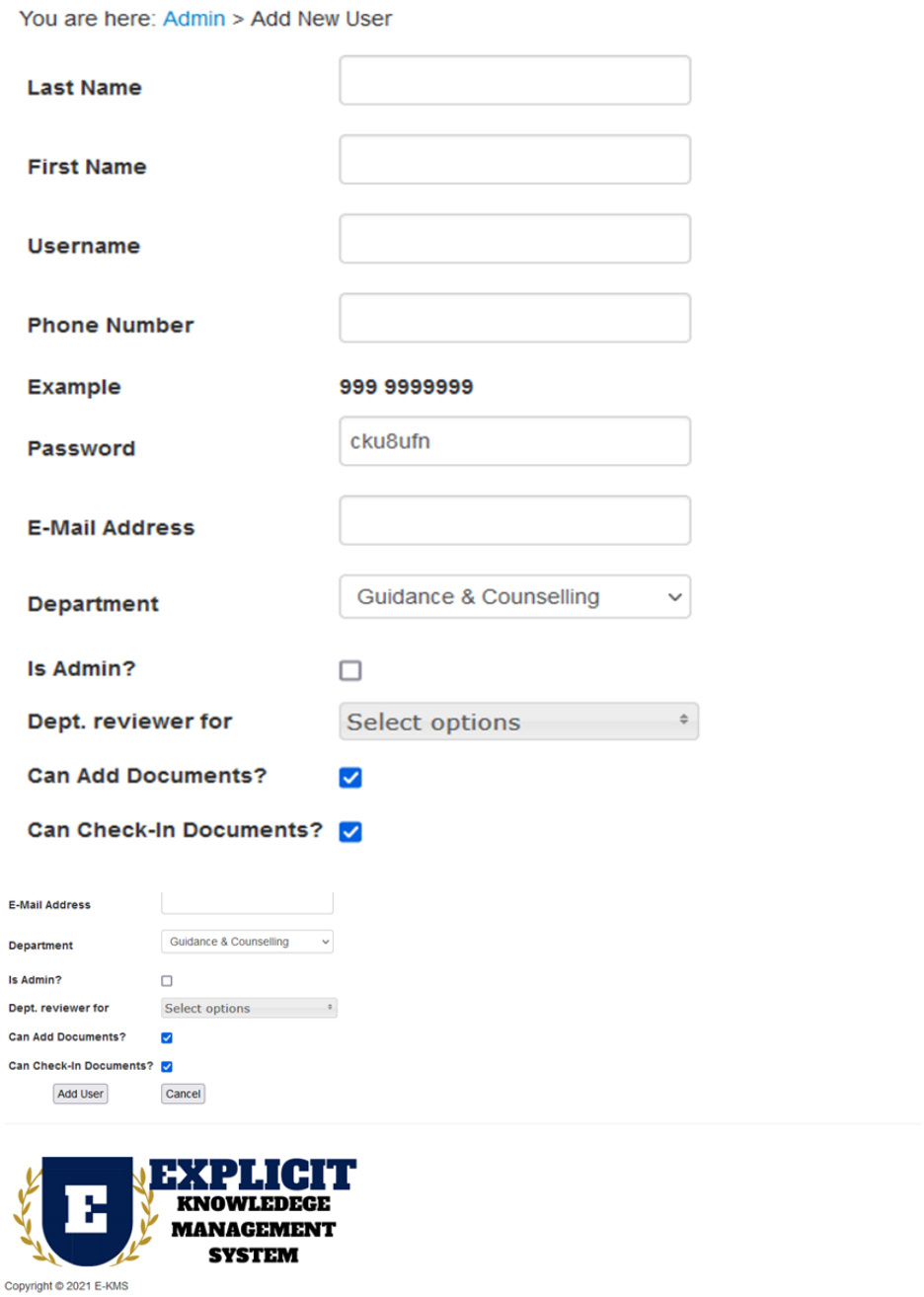


The home page was the gateway to access of this study's prototype. This was the point where users had to input their usernames and passwords so as to access the explicit knowledge management system developed. The system allowed various users like administrators, dean of studies, Head of departments and students to access the system using their own usernames and passwords hence creating discretion and improving cyber security concerns when using the system.

Figure 4.2 contains the users sign-up or registration through which various users are registered to be able to access the system in order to accomplish creating, storing and sharing knowledge.

Figure 4.2

Users' sign –up or registration



According to figure 4.2, every new user is registered here. Under this portal, various users' information is captured e.g., their First name, Last name, user name, their phone number etc. This is to avoid having unauthorized access to the system for security

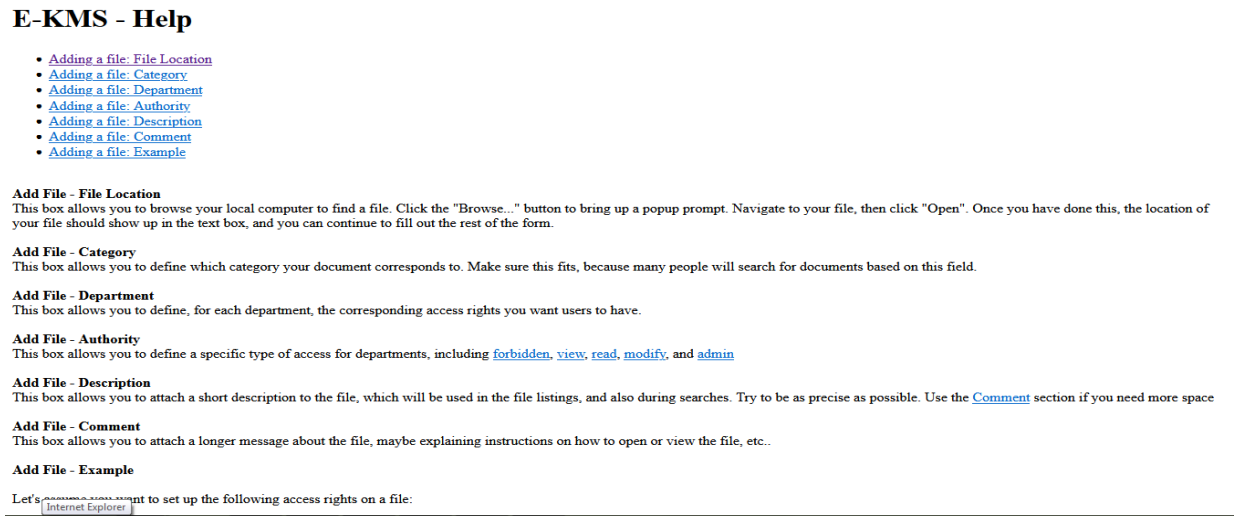
purposes. After the first registration the user is supposed to always log in with their user names and password in order to gain access to the system.

4.9.2 Knowledge Sharing

Figure 4.3 and figure 4.4 shows how knowledge is shared through help and frequently asked questions. This where by the system records the frequently asked questions and their responses so as any user with a similar question can be answered. The help gives support on how to maneuver through in the system with clear guides on various aspects.

Figure 4.3

Help 1



E-KMS - Help

- Adding a file: File Location
- Adding a file: Category
- Adding a file: Department
- Adding a file: Authority
- Adding a file: Description
- Adding a file: Comment
- Adding a file: Example

Add File - File Location
This box allows you to browse your local computer to find a file. Click the "Browse..." button to bring up a popup prompt. Navigate to your file, then click "Open". Once you have done this, the location of your file should show up in the text box, and you can continue to fill out the rest of the form.

Add File - Category
This box allows you to define which category your document corresponds to. Make sure this fits, because many people will search for documents based on this field.

Add File - Department
This box allows you to define, for each department, the corresponding access rights you want users to have.

Add File - Authority
This box allows you to define a specific type of access for departments, including forbidden, view, read, modify, and admin

Add File - Description
This box allows you to attach a short description to the file, which will be used in the file listings, and also during searches. Try to be as precise as possible. Use the Comment section if you need more space

Add File - Comment
This box allows you to attach a longer message about the file, maybe explaining instructions on how to open or view the file, etc..

Add File - Example

Let's [illegible] to set up the following access rights on a file:

Internet Explorer

Figure 4.4

Help 2

Add File - Example

Let's assume you want to set up the following access rights on a file:

- Only you can administer the file
- Only your department can Modify the file
- Only the IS department can Read the file
- Only the Maths department has View rights
- Anyone else is Forbidden

After you select the file location and category, do the following to set the file permissions to match above example:

1. By default, you are set with admin permissions on your new file. See the "Specific Permissions Settings" section. You should see only your username selected under all but the forbidden column.
2. In the Department drop-down box, select your department from the dropdown.
3. Notice the radio toggle buttons below the Department box. These are used to set up each department with specific "department wide" permissions.
4. In the Authority section, click on the Modify button. Your entire department is now set to be able to modify the file
5. In the department drop-down box, select the IS department
6. In the Authority section, click on Read . The entire IS department is now set to be able to read the file
7. In the department drop-down box, select the Maths department
8. In the Authority section, click on the View button. The entire Maths department is now set to be able to view the file
9. In the department drop-down box, select "Default Setting for unset department"
10. In the Authority section, click on the Forbidden . Any department not specifically set is now set to forbidden
11. Now click on the "Add document" button to submit your file

Note: There is also an "All departments" field, which you can use to set all the departments to the same, whether it be admin, read, view, etc..
You may also notice as you are setting permissions that you can go "back" to another department, and the settings are retained.

Rights - Admin
This level of access means you can do anything to the file including downloading, updating, deleting, etc..

Rights - Admin
This level of access means you can do anything to the file including downloading, updating, deleting, etc..

Rights - Modify
This level of access means you can update the file, but not remove it

Rights - Read
This level of access means you can

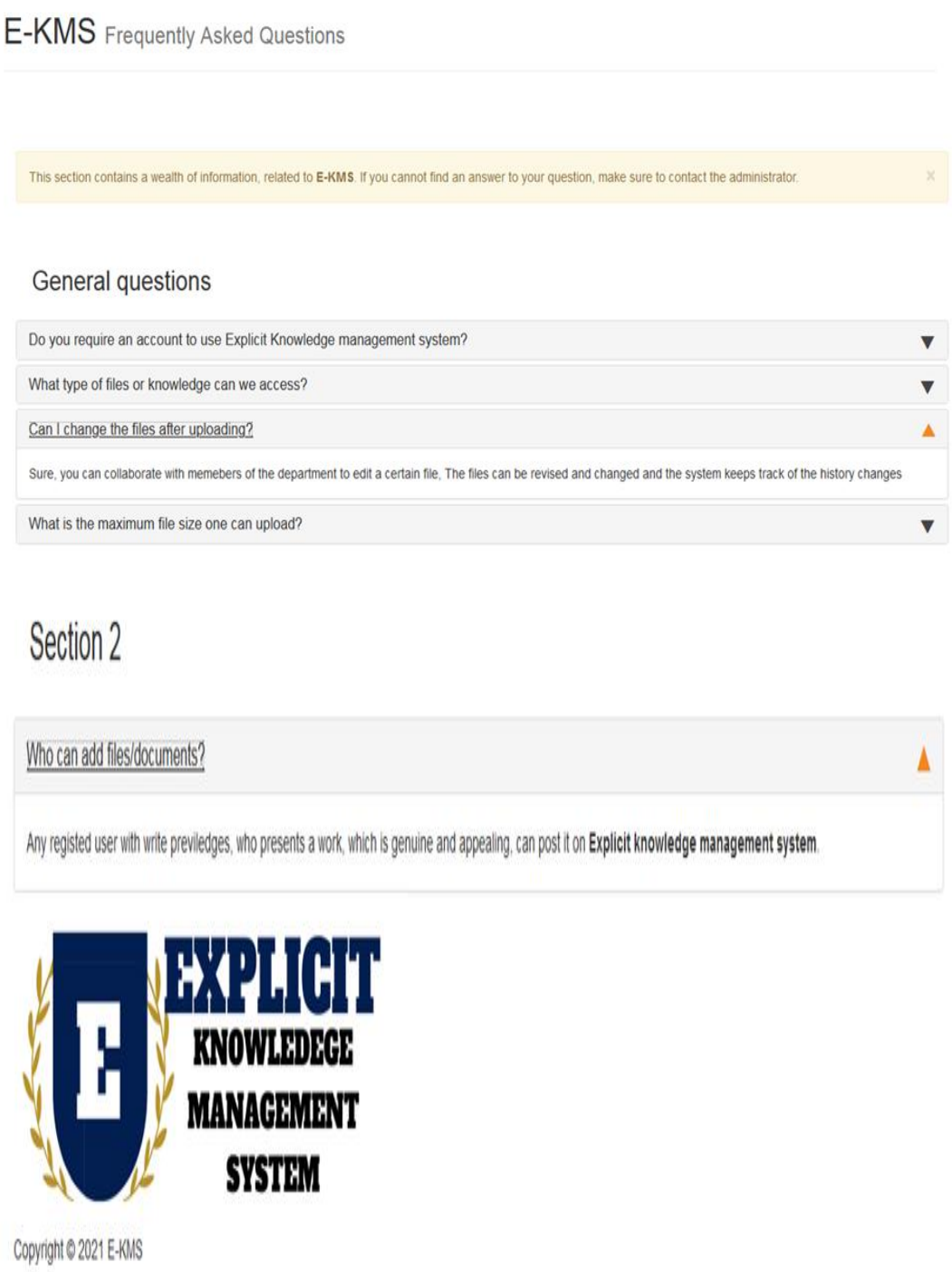
Rights - View

Rights - Forbidden
This level of access means you may not have any access to the file whatsoever and will not see it in any lists, or searches.

EXPLICIT
KNOWLEDEGE
MANAGEMENT
SYSTEM

Figure 4.5

Frequently Asked Questions



4.9.3 Knowledge Storage

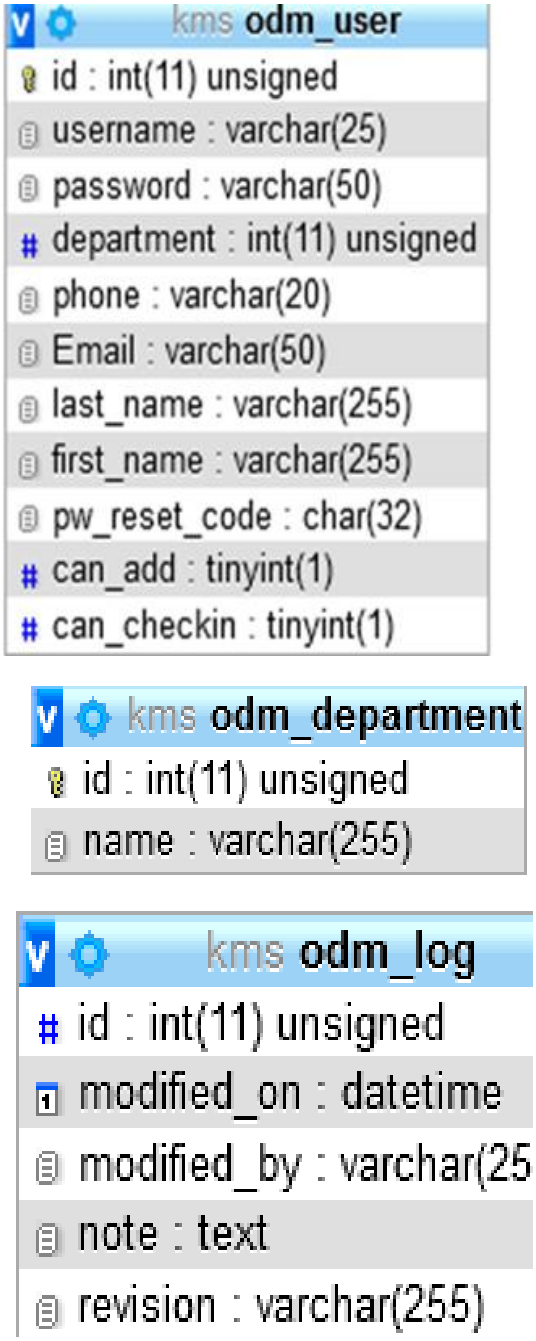
Figure 4.6 shows how knowledge is stored through use of tables

Database Tables

According to figure 4.6, it was a screenshot of some of the tables used in the system to store knowledge. There are different tables to store knowledge like users' tables which is able to store the various information about a user like their names, mobile contacts, e-mail address and their department. Departments table contains of various departments and their materials available, while logs table contains various users and their departments. The stored knowledge would be relevant in the management and usage in explicit knowledge management system.

Figure 4.6

Database tables



4.11 Knowledge Management Implementation Framework

The knowledge management system prototype that was tested, proved to have been working effectively towards creating, sharing and storing knowledge. Various users such as students, teachers and other non-teaching staff were able to access and use knowledge without strain. Figure 4.6 indicates a sample of various knowledge management implementation in the system.

Figure 4.7

Explicit Knowledge management Implementation

ID	View	File Name	Description	Rights	Date Created	Modified Date	Author	Department	Size	Status
26	View	CHEMISTRY P3 QNS.docx	No description available	r | w | a	10 Dec 2021 (13:43)	10 Dec 2021 (13:43)	Mrs Mugambi, Harriet	Math & Sciences	47.44 KB	✔
27	View	COMP P1 MS.docx	No description available	r | w | a	10 Dec 2021 (13:44)	10 Dec 2021 (13:44)	Mrs Mugambi, Harriet	Technicals	172.99 KB	✔
28	View	COMP P1 QNS.docx	No description available	r | w | a	10 Dec 2021 (13:45)	10 Dec 2021 (13:45)	Mrs Mugambi, Harriet	Technicals	28.58 KB	✔
32	View	COMPUTER-STUDIES-P2-MS.docx	No description available	r | w | a	10 Dec 2021 (13:52)	10 Dec 2021 (13:52)	Mrs Mugambi, Harriet	Humanities	73.11 KB	✔
33	View	CRE P2 QNS(1).doc	No description available	r | w | a	10 Dec 2021 (13:57)	10 Dec 2021 (13:57)	Mr Koome, Joseph	Humanities	83 KB	✔
34	View	CRE PP1 MS.docx	No description available	r | w | a	10 Dec 2021 (13:57)	10 Dec 2021 (13:57)	User, Admin	Humanities	28.35 KB	✔
35	View	CRE PP1 QNS.docx	No description	r | w | a	10 Dec 2021	10 Dec 2021	User,	Humanities	18.59	✔

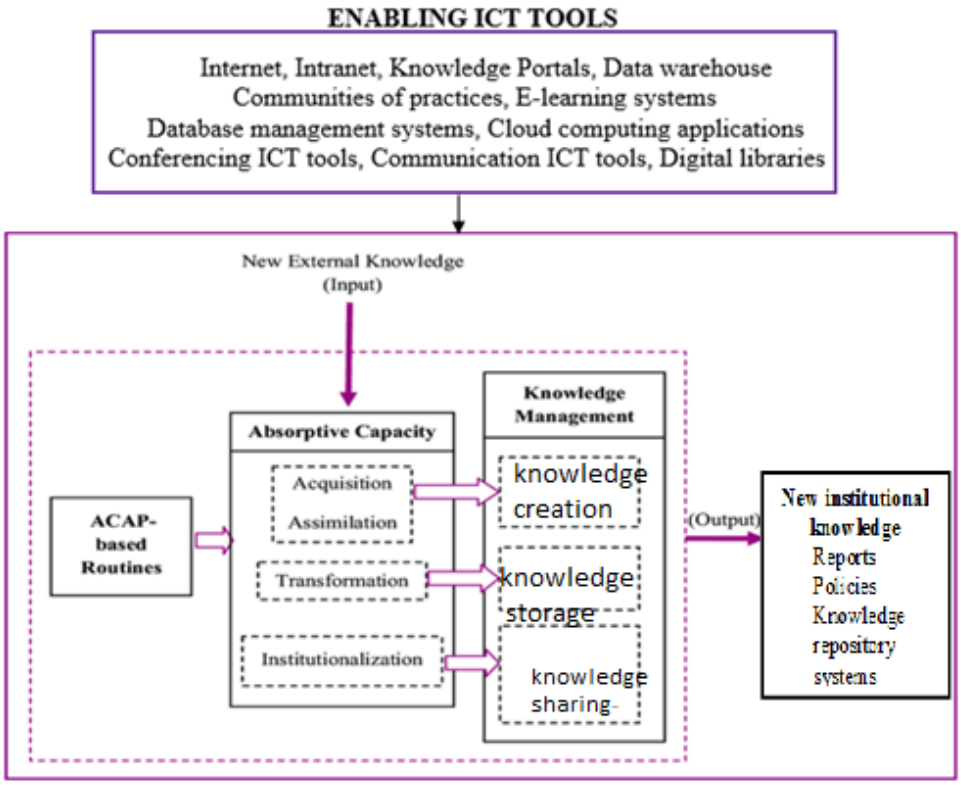
According to Figure 4.7, students and other users had a chance of accessing stored revision materials which were mainly books and documents related to chemistry paper 3, computer paper 1 and 2. CRE paper 1 and 2. Access to these materials provided a platform on creating more knowledge, sharing and storing further new knowledge for future users. This system further provided a multivalent platform for different

departments to access and manage explicit knowledge. If this system is duplicated in various secondary schools, it would be beneficial for users to have a reliable system free from third parties' interference when managing explicit knowledge.

According to the tested knowledge creation module, it was possible for knowledge to be created and remain consistent. Nevertheless, it was evidenced that there was simply lack of appropriate technology for implementing explicit knowledge management in secondary schools. A lot of teachers lacked know how on how to handle the technology and fear on technology hence making it hard in implementing explicit knowledge management in secondary schools. On knowledge storage module, schools had enough ideas on how they could implement ICT storage concerns. The school discovered of other new ways of storage such as how to upload and download documents on the system with back-up located on cloud, and emails. On knowledge sharing module, various sharing platforms such as computer platforms, zoom, and pre-recorded videos were introduced. The school teachers adopted them very fast and incorporated them in their daily activities at least for the one-month duration.

Figure 4.8

Proposed Framework



According to Figure 4.8, it provided key pillars of organizational knowledge management proposed framework. It was organized into 3 stages which are Adaptive Computer Acceleration Platform [ACAP] based routines, Absorptive capacities and knowledge management stages.

ACAP based routine is defined as a computerized system that could be customized to adopt to an institutional need on accepting many users performing different operations in the system. In our case, ACAP based routine could be the system that involves teachers, students and other users who would want to access books, reports, examinations and other academic related documents.

Absorptive capacities level, is described as the ability of an institution to acknowledge the importance of information, integrate and use it for the benefit of achieving the goals of the institution. It was basically grouped into 3 absorptive capacities which are acquisition, transformation and institutionalization.

Acquisition capacity of knowledge management provides an opportunity for the teachers to create, identify and collect explicit knowledge in the school through socialization, externalization, combination and internalization. The teachers used various ICT tools in knowledge creation such as internet, intranet and knowledge portals to mine and research for knowledge. The conferencing ICT tools like google meet; zoom, skype and communication ICT tools like emails were also used to acquire knowledge.

Transformation capacity was the stage into which the school adapt and organize its students, teachers and other users to fit into the new system. They are equipped on how to store the explicit knowledge through reports, database, books and documents.

Institutionalization capacity was the last routine where the students and other users apply and share the knowledge at individual capacities through learning process. This is done through conversations, online meetings, learning sessions, interactive workshop and seminars.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The main purpose of this study was to examine ICT implementation framework for managing explicit knowledge in secondary schools in Meru central sub county. The specific objectives were to assess the influence of ICT tools in knowledge creation, knowledge storage, knowledge sharing, and to develop an ICT framework for implementing explicit knowledge management in secondary schools in Meru central sub county. This study was anchored and guided by three theories which were: knowledge-based view theory, the Unified Theory of Acceptance and Use of Technology and the organization learning theory. In this study, mixed methodology was used to collect data from 16 public and private secondary schools.

The schools were sampled using simple random sampling method. The 16 principals of secondary schools, 143 teachers, 16 school board chairpersons and 16 head prefects took part in the survey. Pre-testing was done in Nkuene girls' secondary school, Nkubu high school and Ntharene day secondary school in Imenti South Sub-County Meru. Descriptive statistics was utilized to analyze the data in this study. Qualitative data was analyzed using text analysis method. The system design and development that this study used to develop the ICT based knowledge management system was prototyping.

5.2 Summary of Results

The study gathered data using questionnaires and interview guides. The results are indicated below.

5.2.1 ICT Tools in Knowledge Creation

The respondents majorly on a mean of 3.12 agreed that their schools had quality knowledge creation practices through ICT tools. In addition, they also confirmed on a mean of 3.07 that there were departments responsible for assessing the created knowledge utilized in the school through ICT tools. On the contrary, the respondents did not agree that there had been use of social media platforms and website to improve learning process in their school and also availability of internet in their schools had greatly influenced knowledge creation (mean 2.45 and 2.46 respectively). This was due to lack of implementation of a framework that guided on knowledge management processes.

The interview results indicated the private secondary schools had internet connection but their counterparts complained as few of them had internet connection while majority did not. The current e-learning systems that the secondary schools were using included e-Kitabu, Eneza education, and eLimu center. The teachers created knowledge through the projection of power point slides, academic related videos through school television screens, emails and telephone calls. In addition, ICT training was dormant before the spike of covid-19 rates in Kenya, however after that period, ICT training has been done frequently with some of the schools holding it quarterly. The majority of schools according to the respondents held the trainings either once or twice in the year 2020 and 2021 respectively.

5.2.2 ICT Tools in Knowledge Storage

The respondents agreed that there had been competitive advantage in their secondary schools due to reliable knowledge management practices like libraries for effective storage (mean 4.44). In addition, the respondents also agreed that students had accessibility to computers which enabled them to store notes and reading materials. However, they did not come to an agreement that there had been improved ICT tools put into place in their school archives to facilitate storage, retrieval of files and books conveniently (mean 2.35). In addition, they also did not come to an agreement that there was an ICT tools periodic review on the efficiency of knowledge storage facilities such as reports, books and documents in the school (mean 2.87).

The interview results indicated that the schools mainly used emails to store documents and social media platforms such as Facebook updates and posts to store images. In addition, they also used personal computers or printed the information in documents which were stored in a book store. The schools did not have reliable information systems which were incorporated in the schools through teachers submitting their set exams into the school' email; applying for their annual, medical or personal leaves online directly into the school system whereby upon approval by the principal, they proceed; filling the students' academic results into the system for purposes of sending the same information to guardians; and un developed systems to communicate on important sensitive issues. The school stored knowledge through using school computers, personal mobile phones and laptops.

5.2.3 ICT Tools in Knowledge Sharing

The respondents agreed that the government has been offering financial support to boost and increase innovation on knowledge sharing through ICT tools (mean 4.78). Additionally, they also agreed that the management has been sharing knowledge to teachers through training plans, workshops, seminars, direct talks and work-based studies (mean 4.73). However, they did not come to an agreement that the students were encouraged to share knowledge amongst themselves through social networks (mean 2.04) due to lack of implementation of a framework that guided on knowledge management processes. This was because the students did not understand the relevance of sharing knowledge in the first place.

In the interview findings, knowledge was shared through emails, local radios, phone calls, text messages, WhatsApp groups and Facebook pages. The challenges faced when knowledge was not shared due to unreliable frameworks included lost opportunities, increased costs, poor interpretation, unawareness on the content of the knowledge intended to be shared, and loss of precious time. The government had also supported these institutions through donating computers and other ICT peripherals, increasing resources allocation such as money; employment of more computer teachers under the Teachers Service Commission [TSC], and supplying of cabled internet under the ministry of communication

5.2.4 ICT Implementation Framework

The respondents confirmed that there was a periodic review on the current framework processes, structure, and ICT (mean 3.05). Nevertheless, they did not come to an agreement that the school board and senior school staff had a clear formality on how to develop and implement policies on explicit knowledge such as the one affecting teaching

and learning (mean of 2.4). They also contradicted that there was a review on frameworks normally done periodically to assess whether the frameworks were working (mean 2.45) resulting to unreliable frameworks that did not help towards implementation of knowledge management processes.

The interview results showed that most of the schools were in the process of developing these policies. According to the principals and board chairpersons, covid-19 pandemic had created a demand to come up with policies on how to effectively implement ICT usage in the schools. The developments made on curriculum through ICT included focus on learner-centered whereby the teachers offer basic ICT skills to students; students were encouraged through being given platforms such as science congress to develop projects that are beneficial to the society; improvement on online registration of KNEC; employment, promotion and transfer of teachers is nowadays done online. The knowledge frameworks placed toward combating covid-19 pandemic included procedures for washing hands, procedures for routine disinfection and fumigation of the school; protocols to follow when a covid-19 case has been suspected; and procedures on students' covid-19 management whereby there are protocols to take on daily basis. Lastly, the implementation lags on frameworks developed was due to lack of enough resources, lack of trained personnel, lack of management support, and poor motivation from the staff.

5.2.5 Implementation of Explicit Knowledge Management

The study established that out of the 138 teachers and students who answered the questionnaires, 14 (10%) agreed and 120(88%) strongly agreed on a mean of 4.78 that ICT tools in knowledge sharing such as g-mail, zoom and Google meet had improved explicit knowledge management in their school. That notwithstanding, the same

respondents did not highly tally as compared to other statements that ICT tools such as e-learning systems in knowledge creation had improved explicit knowledge management in their school. Seventy-three (53%) strongly disagreed and 58(42%) disagreed hence a low mean of 2.02.

In the interview, it was found out that there was an established computer department where users such as students received free computer classes and there were qualified computer teachers. In addition, there was a school staff given the responsibility to manage documents; there was an aerated store established to keep different documents; and there was presence of document issuance log-book that required users of the document to fill in their details for accounting purposes. Training on documents management was done semi-annually and annually. This was because many schools felt that it would give both parties (the teachers and management) time to go through and apply the skills towards management of manuals over a substantive period of time. Further on, the ICT department received funds from MOE, sponsors, donors, parents, alumnae, community and well-wishers.

5.3 Conclusion of Study

The study's conclusion on ICT tools in knowledge creation was that some schools had quality knowledge creation practices and had operational departments responsible for assessing the created knowledge utilized in the school through ICT tools. On the contrary, some schools especially public day schools lacked ICT tools and internet connections in their schools hence minimal use of social media platforms and website to improve learning process hence no E-learning was taking place.

The teachers created explicit knowledge through the projection of power point slides, academic related videos through school television screens, emails and telephone calls. In

addition, ICT training was dormant before the spike of covid-19 rates in Kenya, although it was later awakened after the spike of covid-19 due to the high demand for online learning.

There was still a bone to chew as far as explicit knowledge storage was concerned. The schools had completely not taken any interest in ensuring explicit knowledge was stored in the correct manner through key storage units required. It could not be linked to availability of resources since there was no will to even have timely appraisal on the effectiveness of the current methods and what needed to be done. If it was as a result of a resource like money, there would evidence of periodic appraisals on their methods which would definitely have resulted to brain storming on alternatives to use. As far as this study is concerned, lack of interest was mainly due to low awareness and poor training on the relevance of effective knowledge storage techniques towards explicit knowledge management in secondary schools in Meru central sub- County.

The study's conclusion on ICT tools in explicit knowledge sharing was that there was so much focus in their schools on improving their grades and academic performance through manual books hence failure to focus on how they would come up with frameworks that expose students to electronically share academic materials. This focus was so much monopolistic to a point that students missed out on ICT important aspects in life such as sharing what they know with others through social networks and e-learning systems.

In terms of the implementation of explicit knowledge management, the study concluded that it was not yet fully operational in secondary schools in Meru central sub-county. There were still major set-backs that hampered secondary schools to fully use e-learning systems towards disseminating explicit knowledge.

The study further concluded that there was no ICT implementation framework in use for managing explicit knowledge in secondary schools in Meru central sub-county. This is because there were no policies nor guidelines on how to develop, implement and review frameworks in the secondary schools. This made it hard for the senior management to provide direction on what to do since every one of the team had their way of how they wanted it done. This resulted to disagreements and conflicts that made the frameworks get suspended for long without solutions on how to go about them.

5.4 Recommendations of the Study

The study found out that some schools lacked Reliable ICT tools for knowledge creation, storage and sharing. Some schools also lacked internet connections hence minimal use of social media platforms and website to improve learning process.

Also, there was no ICT implementation framework in use for managing explicit knowledge in secondary schools in Meru central sub-county. This is because there were no policies nor guidelines on how to develop, implement and review frameworks in the secondary schools

The study recommends adoption of the developed framework to improve the efficiency of knowledge creations, storage and sharing in Meru central sub-county Secondary schools. This study further developed an explicit knowledge management system prototype. Through testing, it was ascertained as secure and unique to every user. Close monitoring of the activities of the system is also enabled through special authorization in the system. The students would also get a chance to access various academic documents, reports and examinations based on the approved curriculum. Additionally, the teachers who would wish to upload various input on the syllabus books, would do so through the approval of the administrator. Therefore, the study strongly recommends that secondary schools could adopt such a system in order to be in control of their knowledge

management processes without necessarily requiring the services of an external party to create, share and store explicit knowledge.

The study recommends the management of the secondary schools in Meru central sub county to sensitize on the importance of proper storage of explicit knowledge. The management should partner with several ICT firms for periodic trainings on the best possible way to store explicit knowledge. The teachers should be encouraged to suggest on safe alternatives that the school, could use to store its data. The ministry of education should develop policies that hold school principals accountable for any poor storage infrastructure that leads to loss of information.

The principals and teachers should come up with campaigns and probably seminars on how students could use social media to expand on explicit knowledge sharing avenues. The students should also be each other's keeper on social media use. This will enable them become disciplined and at the same time active in sharing explicit knowledge.

The principals and board members should use their networks to help in funds drive that will enable donors, community, alumina and parents to chip in towards establishing ICT infrastructure. This is because, though the government is supporting them, the government cannot do the entire details of ICT infrastructure.

The study also recommends that the Ministry of Education should liaise with the ICT ministry to fasten the broadband connectivity project to secondary schools in Meru County. This will enable them have reliable internet.

The ministry of education should come up with specific guidelines that provide the format that could always be used in case a school intends to develop and customize its frameworks. In addition, the management should involve consultants' and frameworks developers who would adequately train them on what exactly is needed to be in a framework and not, so that amicable solution is established. TSC should come up with a

clear policy framework that solves any disagreements within a secondary school fast to avoid conflicts that stagnate operations.

The findings of this study will have implications to practice on ministry of education policy developers. They will be guided by the findings of the study on how to come up with policies that support secondary schools with development on various ICT frameworks. These frameworks would act as a catalyst to instigate digital revolution in our Kenyan educational systems. The findings have further implication of the unified theory of acceptance and use of technology since it contributes on how new users such as students in secondary schools could use ICT knowledge in improving their academic experience in the approved curriculum.

5.5 Suggestion of Future Studies

The results were mainly from secondary schools in Meru County, future studies should explore other Kenyan county school to check whether they would get similar or different results.

Principals, teachers, school board chairpersons and head prefects took part in the survey.

Future studies should incorproate other respondents such as non-teaching school staff.

REFERENCES

Abbasi, S. G., & Dastgeer, G. (2018). Effect of contextual factors on knowledge sharing behavior. *Amazonia Investigation, 7*(6), 209-225. https://amazoniainvestiga.info/index.php/amazonia/article/view/396

Al-Kurdi, O., El-Haddadeh, R., & Eldabi, T. (2018). Knowledge sharing in higher education institutions: A systematic review. *Journal of Enterprise Information Management, 31*(2), 226-246. https://doi.org/10.1108/JEIM-09-2017-0129

Aljuwaiber, A. (2016). Communities of practice as an initiative for knowledge sharing in business organizations: A literature review. *Journal of Knowledge Management, 20*(4), 731-748. https://doi.org/10.1108/JKM-12-2015-0494

Alvarenga, A., Matos, F., Godina, R., & Matias, J.C.O. (2020). Digital transformation and knowledge management in the public sector. *Sustainability, 12*(5824), 1-24. https://doi.org/10.3390/su12145824

Akgün, A. E., Keskin, H., Ayar, H., & Okunakol, Z. (2017). Knowledge sharing barriers in software development teams: A multiple case study in Turkey. *Kybernetes, 46*(4), 603-620. http://doi.org/10.1108/K-04-2016-0081

Akinnuwesi, B. A., Odumabo, A., & Aribisala, B. S. (2020). Knowledge grid: An intelligent system for collaboration and knowledge management in Nigerian universities. *Data Science Journal, 19*(1), 1-7. http://doi.org/10.5334/dsj-2020-002

Amber, Q., Ahmad, M., Khan, I. A., & Hashmi, F. A. (2019). Knowledge sharing and social dilemma in bureaucratic organizations: Evidence from public sector in Pakistan. *Cogent Business & Management, 6* (1685445), 245-295. http://doi.org/10.1080/ 23311975.2019.1685445

Akosile, A., & Olatokun, W. (2020). Factors influencing knowledge sharing among academics in Bowen University, Nigeria. *Journal of Librarianship and Information Science*, *52*(2), 410-427. http://doi.org/10.1177/0961000618820926

Akuku, B., Oboko, R., & Waema, T. M. (2020). Institutionalization of knowledge management strategies in agricultural research organizations: A systematic literature review. *Knowledge Management for Development Journal, 15*(1), 1-10. https://www.km4djournal.org/index.php/km4dj/article/view/472/578

Akuku, B., Waema, T.M., Oboko, R., & Brown, I. (2020b). Knowledge management strategies adopted in agricultural research organizations in East Africa. *Information Development, 23*(5), 10-13. *https://doi.org/10.1177/0266666920968165*

Ahlfeld, K. (2019). They paved paradise: School librarians and school libraries are disappearing and we won't know what we've lost until it's gone. *Journal of Library Administration, 59*(8), 927–938. https://doi.org/10.1080/01930826.2019.1661747

Aquilani, B., Abbate, T., & Codini, A. (2017). Overcoming cultural barriers in open innovation processes through intermediaries: A theoretical framework. *Knowledge Management Research & Practice, 15*(3), 447-459. https://doi.org/10.1057/s41275-017-0067-5

Aslani, S., Ramirez- Marin, J., Brett, J., Yao, J., Semnani- Azad, Z., Zhang, Z. X., & Adair, W. (2016). Dignity, face, and honor cultures: A study of negotiation strategy and outcomes in three cultures. *Journal of Organizational Behavior, 37*(8), 1178- 1201. https://doi.org/10.1002/job.2095

Asterhan, C.S.C., & Bouton, E. (2017). Teenage peer-to-peer knowledge sharing through social network sites in secondary schools. *Computers & Education, 110*(4), 16-34. http://doi.org/10.1016/j.compedu.2017.03.007

Bandera, C., Keshtkar, F., Bartolacci, M., Neerudu, S., & Passerini, K. (2017). Knowledge management and the entrepreneur: Insights from Ikujiro Nonaka's dynamic knowledge creation model (SECI). *International Journal of Innovation Studies, 1*(3), 163–174. https://doi.org/10.1016/j.ijis.2017.10.005

Barley, W. C., Treem, J. W., & Kuhn, T. (2018). Valuing multiple trajectories of knowledge: A critical review and agenda for knowledge management research. *Academy of Management Annals, 12*(1), 278-317. https://doi.org/10.5465/annals.2016.0041

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(6), 99–120. https://doi.org/10.1177/014920639101700108

Bloice, L. & Burnett, S., (2016). Barriers to knowledge sharing in third sector social care: A case study. *Journal of Knowledge Management, 20*(1), 125- 145. https://doi.org/10.1108/JKM-12-2014-0495

Boateng, H., Dzandu, M. D., & Tang, Y. (2016). Knowledge sharing among employees in Ghanaian industries: The role of transformational leadership style and communal organizational culture. *Business Information Review, 33*(3), 145-154. https://doi.org/10.1177/0266382116663355

Bosu, L., Asare, P., & Agormedah, E.K. (2019). *Pedagogical content knowledge of Ghanaian senior high school accounting teachers: What does it look like.* Conference: WERA-2019IS13: Invitational Symposium 13: Global South Perspectives on Research on Didactics – Teaching and Learning and Teacher knowledge (GERA: Ghana Educational Research Association) At: The University of Tokyo, Tokyo. https://www.researchgate.net/publication/336286302_Pedagogical_Content_Knowledge_of_Ghanaian_Senior_High_School_Accounting_Teachers_What_does_it_look_like

Brooke, J., Rasdi, R. M., & Samah, B. A. (2017). Modelling knowledge sharing behavior using self-efficacy as a mediator. *European Journal of Training and Development, 41*(2), 144-159. http://dx.doi.org.ezp.waldenulibrary.org/10.1108/EJTD-04-2016-0021

Buunk, I., Smith, C. F., & Hall, H. (2019). Tacit knowledge sharing in online environments: Locating 'Ba'within a platform for public sector professionals. *Journal of Librarianship and Information Science, 51*(4), 1134- 1145. https://doi.org/10.1177/0961000618769982

Canonico, P., De Nito, E., Esposito, V., Iacono, M. P., & Consiglio, S. (2019). Knowledge creation in the automotive industry: Analysing obeya-oriented practices using the SECI model. *Journal of Business Research, 112*(24), 450-457. https://doi.org/10.1016/j. jbusres.2019.11.047

Carter M., & Istenic, S.A. (2018) *social media and the high school environment: innovative technologies and learning. ICITL 2018. Lecture Notes in Computer Science, vol 11003*. Springer, Cham. https://doi.org/10.1007/978-3-319-99737-7_39

Ceptureanu, E., Ceptureanu, S., Popescu, D., & Vlad, L. (2017). Two stage analysis of successful change implementation of knowledge management strategies in energy companies from Romania. *Energies, 10*(12), 1-5. https://ideas.repec.org/a/gam/jeners/v10y2017i12p1965-d120380.html#download

Cascio, W. F., & Montealegre, R. (2016). How technology is changing work and organizations. *Annual Review of Organizational Psychology and Organizational Behavior, 3*(1), 349–375. https://doi.org/10.1146/ annurev-orgpsych-041015-062352

Castaneda, D. I., Ríos, M. F., & Durán, W. F. (2016). Determinants of knowledge sharing intention and knowledge-sharing behavior in a public organization: Knowledge management & e-Learning. *An International Journal, 8*(2), 372-386. https://doi.org/10.34105/j.kmel.2016.08.024

Cheng, E. C. K. (2020). Knowledge transfer strategies and practices for higher education institutions. *VINE Journal of Information and Knowledge Management Systems, 2*(5), 1-10. https://doi.org/10.1108/VJIKMS-11-2019-0184

Chepkorir, S. L., & Kandiri, J. (2018). Information communication technology integration and performance of public secondary schools in Mombasa County, Kenya. *International Journal of Current Aspects, 2*(5), 79-94. https://www.ijcab.org/Journal_Articles/2018/11/IJCAB.2018.8.72.pdf

Cheruiyot, J. K., Sang, N., Ngetich, F. K. (2020). Knowledge management practices, challenges and coping strategies adopted by public agricultural extension: A case of Nandi-Hills Sub-County, Nandi County, Kenya. *Asian Journal of Agricultural Extension Economics & Sociology, 38*(2), 1-13. https://doi.org/10.9734/ajaees/2020/v38i230304

Chia- Nan, C., & Huei-Huang, C. (2016). The study of knowledge management capability and organizational effectiveness in Taiwanesse public utility: The mediator role of organizational commitment. *Springer Plus Journal, 5*(1520), 1-34. https://doi.org/10.1186/s40064-016-3173-6

Chien, S. Y., Lewis, M., Sycara, K., Liu, J. S., & Kumru, A. (2018). The effect of culture on trust in automation: Reliability and workload. *ACM Transactions on Interactive Intelligent Systems (TiiS), 8*(4), 29-30. https://doi.org/10.1145/0000000.0000000

Choi, Y. (2016). The impact of social capital on employees' knowledge-sharing behavior: An empirical analysis of US federal agencies. *Public Performance & Management Review, 39*(2), 381–405. https://doi.org/10.1080/15309576.2015.1108795

Chuang, C. H., Jackson, S. E., & Jiang, Y. (2016). Can knowledge-intensive teamwork be managed. Examining the roles of HRM systems, leadership, and tacit knowledge. *Journal of Management, 42*(2), 524-554. https://doi.org/ 10.1177/0149206313478189

Chumg, H. F., Seaton, J., Cooke, L., & Ding, W. Y. (2016). Factors affecting employees' knowledge-sharing behavior in the virtual organization from the perspectives of well-being and organizational behavior. *Computers in Human Behavior, 64*(1), 432- 448. https://doi.org/10.1016/j.chb.2016.07.01

Communications Authority of Kenya (2020). *Education broadband connectivity project.* https://ca.go.ke/education-broadband-connectivity-project/#:~:text=The%20education%20broadband%20has%20connected,improve%20education%20through%20digital%20learning.

Cram, W. A. (2019). *(Re) considering the concept of reproducibility of information systems literature reviews.* https://www.semanticscholar.org/paper/(Re)considering-the-Concept-of-Reproducibility-of-Cram/1077494f668e69004e6760eb648149150bdd356d

Cui, Y., Lei, H., & Zhou, W. (2018). Changes in school curriculum administration in China. *ECNU Review of Education, 1*(1), 1-10. https://doi.org/10.30926/ecnuroe2018010103

Cumari, G. M. (2018). *Knowledge management practices and performance of Kenya Bureau of Standards* [Master's Thesis, University of Nairobi]. Kenya. http://erepository.uonbi.ac.ke/bitstream/handle/11295/105617/George%20Mungai.pdf?isAllowed=y&sequence=1

Denford, J. S., & Ferriss, A. (2018). Absorption, combination and desorption: Knowledge-oriented boundary spanning capacities. *Journal of Knowledge Management, 22*(7), 1425-1441. https://doi.org/10.1108/JKM-08-2017-0325

Dei, D. J., & Walt, T. B. (2020). Knowledge management practices in universities: The role of communities of practice. *Social Sciences & Humanities Open, 2*(1), 1-10. https://doi.org/10.1016/j.ssaho.2020.100025

Dewah, P., & Mutula, S. M. (2016). Knowledge retention strategies in public sector organizations: Current status in sub-Saharan Africa. *Information Development, 32*(3), 362-376. https://doi.org/10.1177/0266666914551070

Doren, C. V. (1991). *A History of knowledge: Past, present, and future* (3rd Ed.). The Random House Publishing Group

Durodolu, O. O., & Mojapelo, S. M. (2020). Contextualization of the information literacy environment in the South African education sector. *The Electronic Journal of e-Learning, 18*(1), 57-68. https://doi.org/10.34190/EJEL.20.18.1.005

Edmondson, A. C., & Harvey, J. F. (2018). Cross-boundary teaming for innovation: Integrating research on teams and knowledge in organizations. *Human Resource Management Review, 28*(4), 347-360. https://doi.org/10.1016/j.hrmr.2017.03.002

Eiriemiokhale, K.A., & Idiedo, V.O. (2020). Knowledge sharing practices among lecturers in Nigerian universities: A case study. *Information and Knowledge Management, 10*(6), 35-44. https://doi.org/ 10.7176/IKM/10-6-06

El Nagdi, M., & Roehrig, G. (2020). Identity evolution of STEM teachers in Egyptian STEM schools in a time of transition: A case study. *International Journal of STEM Education, 7*(41), 1-16. https://doi.org/10.1186/s40594-020-00235-2

Ergün, E., & Avcı, Ü. (2018). Knowledge sharing self-Efficacy, motivation and sense of community as predictors of knowledge receiving and giving behaviors. *Educational Technology & Society*, *21*(3), 60–73. https://www.jets.net/ets/journals/21_3/6.pdf

European Commission (2020). *Shaping Europe's digital future: The European cloud initiative.* https://ec.europa.eu/digital-single-market/en/european-cloud-initiative

Fenwick, T. J. (1996). Limits of the learning organization: A critical look. *Information Analyses 5*(070), 1-29. https://files.eric.ed.gov/fulltext/ED401395.pdf

Fombad, M. C., & Onyancha, O. B. (2017). Knowledge management for development: Rethinking the trends of knowledge management research in South Africa. J*ournal of Information & Knowledge Management*, *16*(3), 17-50. https://doi.org/10.1142/S0219649217500216

Foss, N. (1996). More critical comments on knowledge-based theories of the firm. *Organization Science, 7*(5), 519-523. http://www.jstor.org/stable/2635288

Gillman, H., Zielinski, C., Dhewa, C., Hagmann, J., & Martins, K. (2020). Challenges and opportunities in measuring knowledge management results and development impact. Part 2. *Knowledge Management for Development Journal, 5*(1), 1-4. https://www.km4djournal.org/index.php/km4dj/article/view/476/567

Ghobadi, S., & Mathiassen, L. (2016). Perceived barriers to effective knowledge sharing in agile software teams. *Information Systems Journal (ISJ), 26*(2), 95-125. https://doi.org/10.1111/isj.12053

Goswami, A. K., & Agrawal, R. K. (2018). A reflection on knowledge sharing research: Patterns and trends. *VINE Journal of Information and Knowledge Management Systems, 48*(3), 352-372. https://doi.org/10.1108/VJIKMS-08-2017-0049

Gürlek, M., & Çemberci, M. (2020). Understanding the relationships among knowledge-oriented leadership, knowledge management capacity, innovation performance and organizational performance. *Kybernetes, 5*(4), 1-10. https://doi.org/10.1108/K-09-2019-0632.

Gonzalez, R., & Melo, T. (2018). Innovation by knowledge exploration and exploitation: An empirical study of the automotive Industry. *Gest. Prod., São Carlos, 25*(1), 1–15. https://doi.org/10.1590/0104- 530X3899-17

Hammouri, Q., & Altaher, A. (2020). The impact of knowledge sharing on employees satisfaction: Review. *International Journal of Psychosocial Rehabilitation, 24*(10), 10-10. https://doi.org/10.37200/IJPR/V24I10/PR300249

Handzic, M. (2017). The KM times they are a-changing. *Journal of Entrepreneurship, Management and Innovation, 13*(3), 7-28. https://jemi.edu.pl/vol-13-issue-3-2017/the-km-times-they-are-a-changing

Hashmani, M., & Ali, S. M. (2016). *Challenges and benefits of implementing knowledge management system in an IT based company: Case study of Limton Innovative Systems*. https://www.researchgate.net/profile/Syed_Mubashir_Ali/publication/294657900_challenges_and_benefits_of_implementing_knowledge_management_system_in_an_it_based_company__case_study_of_limton_innovative_systems/links/56c313e308aee3dcd4163992/challenges-and-benefits-of-implementing-knowledge-management-system-in-an-it-based-company-case-study-of-limton-innovative-systems.pdf

Hayes, A.M., & Bulat, J. (2017). *Disabilities inclusive education systems and policies guide for low- and middle-income countries.* https://doi.org/10.3768/rtipress.2017.op.0043.1707

Heisig, P., Suraj, O. A., Kianto, A., Kemboi, C., Arrau, G. P., & Easa, N. F. (2016). Knowledge management and business performance: Global experts' views on future research needs. *Journal of Knowledge Management, 20*(6), 1169-1198. http://41.89.49.13:8080/xmlui/bitstream/handle/123456789/1208/Kemboi-Knowledge%20management%20and%20business%20performance%20global%20experts%20%20views%20on%20future%20research%20needs....pdf?sequence=1

Hodgins, M., & Dadich, A. (2017). Positive emotion in knowledge creation. *Journal of Health Organization and Management, 31*(2), 162-174. https://doi.org/10.1108/JHOM-06-2016-0108

Hudson, K.G., Lawton, R., & Hugh-Jones, S. (2020). Factors affecting the implementation of a whole school mindfulness program: A qualitative study using the consolidated framework for implementation research. *BMC Health Services Research, 20*(133), 1-10. https://doi.org/10.1186/s12913-020-4942-z

Hunter, J., & O'Brien, L. (2018). How do high school students create knowledge about improving and changing their school. A student voice co-inquiry using digital technologies. *International Journal of Student Voice, 3*(3), 1-10. https://ijsv.psu.edu/?article=how-do-high-school-students-create-knowledge-

about-improving-and-changing-their-school-a-student-voice-co-inquiry-using-digital-technologies

Idhalama, O. U., & Echedom, A. U. (2021). Teachers' awareness of knowledge management and knowledge sharing behavior in secondary schools- Nigeria. *International Journal of Information Science & Management, 19*(1), 1-10. https://ijism.ricest.ac.ir/index.php/ijism/article/view/1688/425

Igbinovia, M. O., & Osuchukwu, N. P. (2018). Predictors of knowledge sharing behavior on sustainable development goals among library personnel in Nigeria. *IFLA Journal, 1*(13), 1-10. https://doi.org/10.1177/0340035218763445

Iqbal, A., Latif, F., Marimon, F., & Sahibzada, U. F. (2018). From knowledge management to organizational performance: Modelling the mediating role of innovation and intellectual capital in higher education. *Journal of Enterprise Information Management, 32*(19), 1-10. https://doi.org/10.1108/JEIM-04-2018-0083

Jami Pour, M., Kouchak Zadeh, Z., & Ahmad Zadeh, N. (2018). Designing an integrated methodology for knowledge management strategic planning: The roadmap toward strategic alignment. *VINE Journal of Information and Knowledge Management Systems, 48*(3), 373-387. https://doi.org/10.1108/VJIKMS-10-2017-0071

Jamshed, S., & Majeed, N. (2019). Relationship between team culture and team performance through lens of knowledge sharing and team emotional intelligence. *Journal of Knowledge Management, 23*(1), 90-109. https://doi.org/10.1108/JKM04-2018-0265

Jarrah, H. Y., & Alkhazaleh, M. S. (2020). Knowledge sharing behavior in the curricula of United Arab Emirates universities and educational organizations. *International Journal of Instruction, 13*(3), 1-16. https://doi.org/10.29333/iji.2020.1331a

Jensen, J. (2017). *Development of student leadership skills and identity: A Case study at a Finnish University* [Master's Thesis, University of Jyväskylä]. Finland. https://jyx.jyu.fi/bitstream/handle/123456789/56117/URN:NBN:fi:jyu-201712044479.pdf?sequence=1

Kaba, A., & Ramaiah, C. K. (2020). Predicting knowledge creation through the use of knowledge acquisition tools and reading knowledge sources. *VINE Journal of Information and Knowledge Management Systems*, *2*(3), 1-10. https://doi.org/10.1108/VJIKMS-07-2019-0106

Kaba, A., & Ramaiah, C. K. (2017). Demographic differences in using knowledge creation tools among faculty members. *Journal of Knowledge Management, 21*(4), 857–871. https://doi.org/10. 1108/JKM-09-2016-0379

Kalema, B. M. M., Motsi, L., & Motjolopane, I. M. (2017). Utilizing IT to enhance knowledge sharing for school educators in developing countries. *Electronic Journal of Information Systems in Developing Countries, 73*(1), 1-22. https://doi.org/10.1002/j.1681-4835.2016.tb00533.x

Khamali, R., & Thairu, W. (2018). Influence of social media on knowledge sharing practices in Kenyan universities: A case of Strathmore university. *Strategic Journal of Business & Change Management, 5*(4), 1816-1836. Https://strategicjournals.com/index.php/journal/article/download/994/986

Khoza, L. T., & Pretorius, A. B. (2017). Factors negatively influencing knowledge sharing in software development. *South African Journal of Information Management, 19*(1). 1-9. https://doi.org/10.4102/sajim.v19i1.776

Khuram, S. (2016). Integrating knowledge management strategies and processes to enhance organizational creativity and performance: An empirical investigation. *Journal of Modelling in Management, 11*(1), 154-179. https://doi.org/10.1108/JM2-07-2014-0061

Kianto, A., Shujahat, M., Hussain, S., Nawaz, F., & Ali, M. (2018). The impact of knowledge management on knowledge worker productivity. *Baltic Journal of Management, 14*(1), 1-10. https://doi.org/10.1108/BJM-12-2017-0404.

Kimile M. N., Bill H., Kurgat K. & Wasike J. (2020) Knowledge sharing among communities of practice in public universities in Kenya. *Journal of Information and Technology, 4*(2), 1-12. https://stratfordjournals.org/journals/index.php/Journal-of-Information-and-Techn/article/view/561/664

Kipkosgei, F., Kang, S.W., & Choi, S. K. (2020). A team-level study of the relationship between knowledge sharing and trust in Kenya: Moderating role of collaborative technology. *Sustainability, 12*(1615), 1-13. https://doi.org/ 10.3390/su12041615

Kissi, E., Boateng, E. B., Adjei-Kumi, T., & Badu, E. (2017). Principal component analysis of challenges facing the implementation of value engineering in public projects in developing countries. *International Journal of Construction Management, 17*(2), 142-150. https://doi.org/ 10.1080/15623599.2016.1233088

Konig, J., Jäger-Biela, J. D., & Nina Glutsch, N. (2020). Adapting to online teaching during COVID-19 school closure: Teacher education and teacher competence effects among early career teachers in Germany. *European Journal of Teacher Education, 43*(4), 1-10. https://doi.org/10.1080/02619768.2020.1809650

Lee, A. S. H., & Lim, T. M. (2017). Strategies to improve knowledge sharing in trading construction organization. *Information Technology in Industry, 5*(1), 7-15. https://www.km4djournal.org/index.php/km4dj/article/download/472/578/1448

Lemma, M., & Tesfaye, B. (2017). Agricultural knowledge centers: Opportunities and challenges for ICT-enabled knowledge management in Ethiopia. *International Journal of Agricultural Extension and Rural Development, 4*(1), 274-281. https://internationalscholarsjournals.org/print.php?article=agricultural-knowledge-cent

Leonardi, P. M. (2017). The social media revolution: Sharing and learning in the age of leaky knowledge. *Information and Organization, 27*(1), 47-59. https://doi.org/10.1016/j.infoandorg.2017.01.004

Li, M., Liu, H., & Zhou, J. (2018). G-SECI model-based knowledge creation for CoPS innovation: The role of grey knowledge. *Journal of Knowledge Management, 22*(4), 887–911. https://doi.org/10.1108/JKM-10- 2016-0458

Lin, C., & Huang, C. (2020). Understanding the antecedents of knowledge sharing behavior and its relationship to team effectiveness and individual learning. *Australasian Journal of Educational Technology, 36*(2), 89-104. https://doi.org/10.14742/ajet.4549

Little, T. A., & Deokar, A. V. (2016). Understanding knowledge creation in the context of knowledge-intensive business processes. *Journal of Knowledge Management, 20*(5), 858–879. https://doi.org/10. 1108/JKM-11-2015-0443

Liu, D., Maimaitijiang, R., Gu, J., Zhong, S., Zhou, M., Wu, Z., Luo, A., Lu, C., & Hao, Y. (2019).
Using the Unified Theory of Acceptance and Use of Technology (UTAUT) to investigate the intention to use physical activity apps: Cross-Sectional Survey *JMIR Mhealth Uhealth, 7*(9), e13127
https://doi.org/10.2196/13127

Lyra, M. G., Gomes, R. C., & Pinto, M. M., (2017). Knowledge sharing relevance in social responsibility partnerships. *Journal of Management Development, 36*(1), 129-138. https://doi.org/10.1108/JMD-10-2014-0123

Mafabi, S., Nasiima, S., Muhimbise, E. M., Kasekende, F., & Nakiyonga, C. (2017). The mediation role of intention in knowledge sharing behavior. *VINE Journal of Information and Knowledge Management Systems, 47*(2), 172-193. https://doi.org/10.1108/JIKMS-02-2016-0008

Maisamari, A. M., Adikwu, V. O., Ogwuche, C. O., Ikwoche, F. I. (2018). Assessment of secondary school teachers' use of Information and Communication Technology (ICT) in Anyingba Metropolis, Kogi State, Nigeria. *Journal of Education & Entrepreneurship, 5*(1), 32-47. https://doi.org/10.26762/jee.2018.40000010

Manaf, H. A., Armstrong S. J., Lawton A., & Harvey, W. S (2018). Managerial tacit knowledge, individual performance, and the moderating role of employee personality. *International Journal of Public Administration, 41*(15), 1258 – 1270. https://doi.org/10.1080/01900692.2017.1386676

Manca, S., & Grion, V. (2017). Engaging students in school participatory practice through Facebook: The story of a failure. *British Journal of Educational Technology, 48(5),* 1153-1163. https://doi.org/10.1111/bjet.12527

Massaro, M., Handley, K., Bagnoli, C., & Dumay, J. (2016). Knowledge management in small and medium enterprises: A structured literature review. *Journal of*

Knowledge Management, *20*(2), 258-291. https://doi.org/10.1108/JKM-08-2015-0320

Massingham, P. R. (2018). Measuring the impact of knowledge loss: A longitudinal study. *Journal of Knowledge Management, 22*(4), 721-758. http://dx.doi.org/10.1108/JKM-08-2016-0338

Mastercard Foundation (2020). *Twelve African EdTech companies named as first fellows at center for innovative teaching and learning in ICT: EdTech innovators aim to improve teaching and learning in secondary education.* https://mastercardfdn.org/twelve-african-edtech-companies-named-as-first-fellows-at-centre-for-innovative-teaching-and-learning-in-ict/

Masuin, R., Latief, Y., & Zagloel, T. Y. (2019). Development of information systems in integrated management systems in order to increase organizational performance in a construction company. *IOP Conference Series: Earth and Environmental Science, 258*(012012), 1-25. https://doi.org/10.1088/1755-1315/258/1/012012.

Meterko, M., Restuccia, J. D., Stolzmann, K., Mohr, D., Brennan, C., Glasgow, J., & Kaboli, P. (2015). Response rates, nonresponse bias, and data quality: Results from a national survey of senior healthcare leaders. *Public Opinion Quarterly, 79*(1), 130–144. https://doi.org/10.1093/poq/nfu052

Mburia, G. S. (2020). Knowledge management practices and project performance in Tharaka Nithi County, Kenya. *International Journal of Business Management, Entrepreneurship and Innovation, 2*(4), 1-15. https://doi.org/10.35942/jbmed.v2i4.144

Meru County Government (2018). *Meru county integrated development plan, 2018-2022.* https://maarifa.cog.go.ke/lib.php?f=cidp-meru-2018-2022

Mganga, J. J. (2017). Knowledge management practices and performance of national government ministries in Kenya. *Strategic Journal of Business & Change Management, 4*(4), 1-10. https://strategicjournals.com/index.php/journal/article/view/573/596

Ministry of Education (2018). *National education sector strategic plan for the period 2018 – 2022.* http://planipolis.iiep.unesco.org/sites/planipolis/files/ressources/kenya-nessp-2018-2022.pdf

Mishra, P., Pandey, C. M., Singh, U., Gupta, A., Sahu, C., & Keshri, A. (2019). Descriptive statistics and normality tests for statistical data. *Annals of cardiac anaesthesia, 22*(1), 67–72. https://doi.org/10.4103/aca.ACA_157_18

Mkhongi, F. A., & Musakwa, W. (2020). Perspectives of GIS education in high schools: An evaluation of uMgungundlovu District, KwaZulu-Natal, South Africa. *Education Sciences, 10*(131), 1-15. https://doi.org/10.3390/educsci10050131

Ministry of Education- Kenya (2019). *Basic education statistical booklet.* https://www.education.go.ke/images/Approved_Basic_Education_Statistical_Booklet_2019_approved_compressed.pdf

Ministry of Education (2014). *Basic education statistical booklet.* https://www.education.go.ke/images/NESSP/MOE-NESSP.pdf

Moghavvemi, S., Salleh, N. A. M., & Abessi, M. (2013). Determinants of it-related innovation acceptance and use behavior: Theoretical integration of unified theory of acceptance and use of technology and entrepreneurial potential model. *Social Technologies, 3*(2), 243–260. https://www3.mruni.eu/ojs/social-technologies/article/download/1863/1701

Murumba, J. W., Kwanya, T., Maina, J. C., & Wangamati, A. S. (2020). Tacit knowledge management at universities in Kenya. *Online Journal of Applied Knowledge Management, 8*(1), 117-145. https://doi.org/1010.36965/OJAKM.2020.8(1

Muthuveloo, R., Shanmugam, N., & Teoh, A. P. (2017). The impact of tacit knowledge management on organizational performance: Evidence from Malaysia. *Asia Pacific Management Review, 22*(4), 192–201. https://doi.org/10.1016/j.apmrv.2017.07.010

Mtega, W. P., & Ngoepe, M. (2020). Knowledge management best practices among rice farmers in selected areas of Tanzania. *Journal of Librarianship and Information Science, 52*(2), 331-344. https:// doi.org/10.1177/0961000619856087

Mclver, D., & Lepisto, D. A. (2017). Effects of knowledge management on unit performance: Examining the moderating role of tacitness and learnability *Journal of Knowledge Management, 21*(4), 796–816. https://doi.org/10.1108/JKM-08-2016-0347

Mehralian, G., Nazari, J. A., & Ghasemzadeh, P. (2018). The effects of knowledge creation process on organizational performance using the BSC approach: The mediating role of intellectual capital. *Journal of Knowledge Management, 22*(4), 802-823. https://doi.org/10.1108/JKM-10-2016-0457

Ngulube, P. (2017). *Handbook of research on social, cultural, and educational considerations of indigenous knowledge in developing countries* (1st Ed.). IGI Global. https://www.researchgate.net/profile/Christine_Stilwell/publication/308984938_Indigenous_Knowledge_Management_Practices_in_Indigenous_Organizations_in_South_Africa_and_Tanzania/links/5834317108ae102f0738ef0b/Indigenous-Knowledge-Management-Practices-in-Indigenous-Organizations-in-South-Africa-and-Tanzania.pdf

Nguyo, P., Kimwele, M., & Guyo, W. (2015). *Influence of ICT on knowledge sharing in state corporations in Kenya: A case of the Kenya National Library Service. 1, 1–21.* http://iajournals.org/articles/iajist_v1_i4_1_21.pdf

Njoka, A. (2016). *Collection development policy: Nkubu high school.* https://www.coursehero.com/file/23069278/nkubu-library-policy/

Nonaka, I., Toyama, R., & Konno, N. (2000). SECI, Ba and leadership: A unified model of dynamic knowledge creation. Long range planning. *International Journal of Strategic Management, 33(*1), 5–34. https://doi.org/10.1016/S0024-6301(99)00115-6

Nunes, J. M. B., Kanwal, S., & Arif, M. (2017). *Knowledge management practices in higher education institutions: A systematic literature review.* http://library.ifla.org/1716/1/230-nunes-en.pdf

Odeniyi, O. A., & Adeyanju, A. S. (2020). Assessment of school record management in secondary schools in federal capital territory. *Open Journals of Educational Development (OJED), 1*(1), 54-65. https://www.openjournalsnigeria.org.ng/pub/ojed20200104.pdf

Odero, E. A. (2017). *Effect of knowledge management on competitive advantage of audit firms in Kenya: Case of Grant Thornton Kenya* [Master's Thesis, United States International University-Africa]. Kenya. http://erepo.usiu.ac.ke/bitstream/handle/11732/3359/EPHRAIM%20ALCOTT%20ODERO%20MBA%202017.pdf?sequence=1&isAllowed=y

Ogbonna, V. A. (2020). *Experienced barriers to tacit knowledge sharing in anglophone West Africa* [Dissertation, Walden University]. Minnesota. https://scholarworks.waldenu.edu/dissertations/9420

Ojo, O. A., & Adu, E. O. (2018). The effectiveness of Information and Communication Technologies (ICTs) in teaching and learning in high schools in Eastern Cape Province. *South African Journal of Education, 38*(2), 1-11. https://doi.org/10.15700/saje.v38ns2a1483

Oktarina, N., Murwatiningsih, J. W., & Suryanto, E. (2020). How to improve the effectiveness of school archives management in the industrial revolution era 4.0. *In international conference on economics, business and economic education 2019, KnE Social Sciences, 528–535.* https://doi.org/10.18502/kss.v4i6.6624

Omona, W., Lubega, J., & Weide, J. T. (2010). Using ICT to enhance knowledge management in higher education: A conceptual framework and research agenda. *International Journal of Education and Development Using Information and Communication Technology, 6*(1), 83–101. https://files.eric.ed.gov/fulltext/EJ1085009.pdf

Ongus, R. W., Aming'a, N. N., Nyamboga, C. M., & Okello, G. (2016). Knowledge management practices and organizational performance in selected campuses of Kisii University, Kenya. *SRELS Journal of Information Management, 53*(5), 349-359. https://doi.org/10.17821/srels/2016/v53i5/99677

Opeke, R. O., Iroaganachi, M. A., Babalola, Y. T., & Soyemi, O. D. (2020). Knowledge sharing imperatives on STEM career path intentions among secondary school students in Northern-Central Nigeria. *Information Impact:*

Journal of Information and Knowledge Management, 11(1), 1-15, https://doi.org/10.4314/iijikm.v11i1.1

Organisation for Economic Co-operation and Development (2020). *A framework to guide an educational response to the covid-19 9andemic of 2020.* https://globaled.gse.harvard.edu/files/geii/files/framework_guide_v1_002.pdf

Paré, G., Tate, M., Johnstone, D., & Kitsiou, S. (2016). Contextualizing the twin concepts of systematicity and transparency in information systems literature reviews. *European Journal of Information Systems, 25*(6), 493-508. https://doi.org/10.1057/s41303-016-0020-3

Pee, L. G., & Kankanhalli, A. (2009). *Knowledge management capability: A resource-based comparison of public and private organizations. Conference: Proceedings of the International Conference on Information Systems, ICIS 2009, Phoenix, Arizona, USA.* https://www.researchgate.net/profile/L_G_Pee/publication/221599885_Knowledge_Management_Capability_A_Resource-Based_Comparison_of_Public_and_Private_Organizations/links/5b97597592851c78c41b01f2/Knowledge-Management-Capability-A-Resource-Based-Comparison-of-Public-and-Private-Organizations.pdf

Penrose, E. (1959). *The theory of the growth of the firm.* Basil Blackwell Publisher.

Pineda, A. P. M., Maderazo, M., Pineda, R. M., & Reyes, F. D. (2020). Knowledge management as a strategy for attaining quality in the selected petroleum Industries in the Middle East and North African (MENA) Region. *Mediterranean Journal of Social Sciences, 11*(3), 1-10. https://doi.org/10.36941/mjss-2020-0026

Ramy, A., Floody, J., Ragab, M. A., & Arisha, A. (2018). A scientometric analysis of Knowledge Management Research and Practice literature: 2003–2015. *Knowledge Management Research & Practice, 16*(1), 66-77. httpps://doi.org/10.1080/14778238.2017.1405776

Raudeliūnienė, J., Tvaronavičienė, M., & Blažytė, M. (2020). Knowledge management practice in general education schools as a tool for sustainable development. *Sustainability, 12*(10), 4034-4044. https://doi.org/10.3390/su12104034

Riaz, H., & Hassan, A. (2019). Mediating role of organizational creativity between employees' intention in knowledge management process and organizational performance: An empirical study on pharmaceutical employees. *Pakistan Journal of Commerce and Social Sciences (PJCSS), 13*(3), 635-655. https://www.econstor.eu/bitstream/10419/205271/1/4355.pdf

Ronoh, E. K., Rotich, J. C., Ntabo, V. N., Korir, S., Onguso, B. N., & Anthony, S. Mang‘oka, A. S. (2020). The role of knowledge management towards the achievement of vision 2030: A survey of secondary school drop outs in Rongai District of Nakuru County, Kenya. *Information and Knowledge Management, 4*(8), 166-175. https://core.ac.uk/download/pdf/234671767.pdf

Rumelt, R. P. (1991). How much does industry matter. *Strategic Management Journal, 12*(3), 167-185. https://doi.org/10.1002/smj.4250120302

Saprai, P. (2017). Balfour v Balfour and the separation of contract and promise. *Legal Studies, 37*(3), 1-10. https://doi.org/10.1111/lest.12162

Sasson, E., Ravid, G., & Pliskin, N. (2017). Creation of knowledge-added concept maps: time augmention via pairwise temporal analysis. *Journal of Knowledge Management, 21*(1), 132-155. https://doi.org/10.1108/JKM-07-2016-0279

Serenko, A., Bontis, N., & Hardie, T. (2007). Organizational size and knowledge flow: A proposed theoretical link. *Journal of Intellectual Capital, 8*(4), 610-627. https://doi.org/10.1108/14691930710830783

Shahzad, K., Bajwa, S. U., Siddiqi, A. F., Ahmid, F., & Sultani, A. R. (2016). Integrating knowledge management strategies and processes to enhance organizational creativity and performance: An empirical investigation. *Journal of Modelling in Management, 11*(1), 154-179. https://pdfs.semanticscholar.org/e9c6/46dbe2f096e3b363582f2695d39f801f82bb.pdf

Sahibzada, U, F., Latif, K. F., Xu, Y., & Khalid, R. (2020). Catalyzing knowledge management processes towards knowledge worker satisfaction: fuzzy-set qualitative comparative analysis. *Journal of Knowledge Management, 24*(10), 2373-2400. https://doi.org/10.1108/JKM-02-2020-0093.

Sahibzada, U. M., Cai, J., Latif, K. F., Sahibzada, H. F. (2019). Knowledge management processes, knowledge worker satisfaction, and organizational performance. *ASLIB Journal of Information Management, 72*(1), 112-129. https://doi.org/10.1108/AJIM-10-2019-0276.

Shujahat, M., Ali, B., Nawaz, F., Durst, S., & Kianto, A. (2018). Translating the impact of knowledge management into knowledge-based innovation: The neglected and mediating role of knowledge-worker satisfaction. *Human Factors and Ergonomics in Manufacturing & Service Industries, 28*(4), 200-212. https://doi.org/10.1002/hfm.20735

Sikombe, S., Phiri, M. A., & Wright, L. T. (2019). Exploring tacit knowledge transfer and innovation capabilities within the buyer–supplier collaboration: A literature review. *Cogent Business & Management, 6*(1), 1-10. https://doi.org/10.1080/23311975.2019.1683130

Sileyew, K.J. (2019). *Research design and methodology.* https://doi.org/10.5772/intechopen.85731

Silva, M. S. A., & Lima, C. G. S. (2017). *The role of information systems in human resource management.* https:// doi.org/1010.5772/intechopen.79294

Škerlavaj, M., Connelly, C. E., Cerne, M., & Dysvik, A. (2018). Tell me if you can: Time pressure, prosocial motivation, perspective taking, and knowledge hiding. *Journal of Knowledge Management, 22*(7), 1489-1509. https://doi.org/10.1108/JKM-05-2017-0179

Song, B., Li, Y., & Zhao, L. (2019). Complementary effect of knowledge management strategy on firm performance: Evidence from Chinese firms. *Sustainability, 11*(13), 3616. https://www.researchgate.net/publication/334154235_Complementary_Effect_of_Knowledge_Management_Strategy_on_Firm_Performance_Evidence_from_Chinese_Firms

Taherdoost, H. (2016). Sampling methods in research methodology: How to choose a sampling technique for research. *International Journal of Academic Research in Management (IJARM), 5*(1), 1-11. https://hal.archives-ouvertes.fr/hal-02546796/document

Thang, N. N. (2020). Knowledge acquisition, knowledge management strategy and innovation: An empirical study of Vietnamese firms. *Cogent Business & Management , 7*(1), 1-10. https://doi.org/10.1080/23311975.2020.1786314

Tootell, A., Kyriazis, E., Billsberry, J., Ambrosini, V., Garrett-Jones, S., & Wallace, G. (2020). Knowledge creation in complex inter-organizational arrangements: Understanding the barriers and enablers of university-industry knowledge creation in science-based cooperation. *Journal of Knowledge Management*, 25(7), 1-13. https://doi.org/10.1108/JKM-06-2020-0461

Turner, P. (2019). Critical values for the Durbin-Watson test in large samples. *Applied Economics Letters , 27*(18), 1495-1499. https://doi.org/10.1080/13504851.2019.1691711

United Nations Educational, Scientific and Cultural Organization (2019). *Improving quality and relevance of education through mobile learning in Rwanda: A promise to deliver: Case study by the UNESCO-Fazheng project on best practices in mobile learning.* https://www.gcedclearinghouse.org/sites/default/files/resources/190242eng.pdf

Valaei, N., Nikhashemi, S. R., & Javan, N. (2017). Organizational factors and process capabilities in a KM strategy: Toward a unified theory. *Journal of Management Development, 36*(4), 560-580. https://doi.org/10.1108/JMD-04-2016-0057

Vatcheva, K. P., Lee, M., McCormick, J. B., & Rahbar, M. H. (2016). Multicollinearity in regression analyses conducted in epidemiologic studies. *Epidemiology (Sunnyvale, Calif.), 6*(2), 227-237. https://doi.org/10.4172/2161-1165.1000227

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478. https://doi.org/10.2307/30036540

Wang, Z., Sharma, P. N., & Cao, J. (2016). From knowledge sharing to firm performance: A predictive model comparison. *Journal of Business Research, 69*(10), 4650-4658. https://doi.org/10.1016/j.jbusres.2016.03.055

Wheelock, D. C. (2020). What can we learn from the Spanish flu pandemic of 1918-19 for COVID-19. *Economic Synopses, 4*(30), 1-10. https://doi.org/10.20955/es.2020.30

Yang, J., Roy, S., & Goel, V. (2020). Who engages in explicit knowledge creation after graduation? Evidence from the alumni impact survey of a large Canadian public university. *Studies in Higher Education*, *20*(4), 1–15. https://doi.org/10.1080/03075079.2020.1732907

Yasir, M., Majid, A., & Yasir, M. (2017). Nexus of knowledge-management enablers, trust and knowledge-sharing in research universities. *Journal of Applied Research in Higher Education, 9*(3), 424-438. https://doi. org/10.1108/JARHE-10-2016-0068

Yoo, S., Jeong, S., Song, J. H., & Bae, S. (2020). Transformational leadership and knowledge creation practices in Korean and US schools: Knowledge assets as mediators. *Knowledge Management Research & Practice, 16*(4), 215-225. https://doi.org/10.1080/14778238.2020.1767519

Zhang, R., Li, Y., Zhang, A. L., Yuan Wang, Y., & Mario J. Molina, M. J. (2020). Identifying airborne transmission as the dominant route for the spread of Covid-19. *Proceedings of the National Academy of Sciences of the United States of America (PNAS), 117*(26), 14857-14863. https://doi.org/10.1073/pnas.2009637117

Zhang, W., & Zhang, W. (2018). Knowledge creation through industry chain in resource-based industry: Case study on phosphorus chemical industry chain in western Guizhou of China. *Journal of Knowledge Management, 22*(5), 1037–1060. https://doi.org/10. 1108/JKM-02-2017-0061

Zhang, W., Wang, Y., Yang, L., & Wang, C. (2020). Suspending classes without stopping learning: China's education emergency management policy in the covid-19 outbreak. *Journal of Risk and Financial Management, 13*(55), 1-6. https://doi.org/10.3390/jrfm13030055

Zhou, F., Chen, Q., & Yenchun Wu, Y. (2018). How to foster frontline employee knowledge sharing within service- oriented enterprises: Empirical evidence from China. *Human Factors and Ergonomics in Manufacturing & Service Industries, 29*(1), 22-30. https://doi.org/10.1002/hfm.20768

Zhu, Y., Chiu, H., & Holguin-Veras, E. J. (2018). It is more blessed to give than to receive: Examining the impact of knowledge sharing on sharers and recipients. *Journal of Knowledge Management, 22*(1), 76-91. https://doi.org/ 10.1108/JKM-06-2018-0360

APPENDICES

Appendix I: Authorization letter

Arimi Harriet Karwitha,

Telephone: 0727733078,

Email: harriet.arimi@gmail.com,

P.O Box 86-60202,

Meru Kenya.

4th August,2021.

To Sub- County Education Director,

Meru Central Kenya.

RE: REQUEST TO CONDUCT A STUDY IN SECONDARY SCHOOLS IN MERU CENTRAL

I am a student undertaking master's degree in computer information system in the school of science and technology of Kenya Methodist University (KeMU). As part of my studies, I am conducting a study on the topic: ICT implementation framework for managing explicit knowledge in secondary schools in Meru central sub-county. I would like to request for your authorization to conduct interviews to the principals and board memebrs while questionnaires will be used to collect data from teachers and students. The interview guide and questionnaires are attached with this letter.

The responses will be treated with utmost confidentiality and will be used solely for the academic purpose of this study. Your assistance will be highly appreciated.

Yours faithfully,

Arimi Harriet Karwitha

School Reg no: MCS-3-0164-1/2015
Telephone: 0727733078

Appendix II: Introduction letter

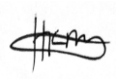
Dear Participant,

I invite you to participate in a Research study entitled ICT framework for implementation of explicit knowledge in secondary schools in Meru central sub-county. I am a student currently enrolled in the computer information system in the school of science and technology of Kenya Methodist University (KeMU) and I am in the process of writing my research project. Your participation in this survey is completely voluntary.

Your responses will remain confidential and anonymous. Data from this survey will be kept under secure systems and reported as a collective effort. If you agree to participate in this survey, please answer the questions on the questionnaire/ interview as best you can. It should take approximately 20 minutes to complete.

Thank you for your assistance in this important Endeavour.

Yours faithfully,



Arimi Harriet Karwitha

School Reg no: MCS-3-0164-1/2015

Telephone: 0727733078

Appendix III: Interview guide for principals and board chairs

SECTION A: DEMOGRAPHIC INFORMATION

1. What is your highest level of academic qualification?
2. How long have you worked in this school?

SECTION B: ICT TOOLS IN KNOWLEDGE CREATION FOR MANAGING EXPLICIT KNOWLEDGE

1 Does the school have any internet connection?
2 Does the school use any E- learning system?
3 In what ICT ways do the teachers use to create knowledge?
4 Has there been any ICT training/Workshop/Seminar in the last three years?
5 Describe how training has influenced proper creation of knowledge in your school?

SECTION C: ICT TOOLS IN KNOWLEDGE STORAGE FOR MANAGING EXPLICIT KNOWLEDGE

1. Kindly clarify how this school archives various information through ICT tools?
2. In what ways has the school management incorporated information systems in management of staff?
3. Explain how students and staff are able to store knowledge through ICT tools in this school?
4. Please highlight some of the challenges facing students and staffs as they perform the storage tasks using ICT tools?
5. Please describe the influence of knowledge storage ICT tools on implementation of explicit knowledge management?

SECTION D: ICT TOOLS IN KNOWLEDGE SHARING FOR MANAGING EXPLICIT KNOWLEDGE

1. Elaborate how this secondary school has been sharing knowledge through ICT tools during the covid-19 pandemic?

2. Explain various forms of passing information used in this school?
3. Briefly mention various approaches that the management takes when sharing knowledge using ICT tools with external stakeholders of the school?
4. Please name the challenges faced to limited or lack of knowledge sharing using ICT tools in the school?
5. What contributions has the government made pertaining ICT tools installation in this school?

SECTION E: ICT IMPLEMENTATION FRAMEWORK FOR MANAGING EXPLICIT KNOWLEDGE

1. Does the school have any ICT policy or guidelines on ICT usage?
2. In what way has availability of ICT tools such as g-mail, zoom and e-learning systems improved knowledge management activities?
3. Describe the developments made on the curriculum system of secondary schools through use of ICT tools?
4. Please name some of the knowledge frameworks put into place toward combating covid-19 pandemic in this secondary school?
5. Highlight causes of implementation lags on frameworks developed?

SECTION F: IMPLEMENTATION OF EXPLICIT KNOWLEDGE MANAGEMENT

1. Explain how the school ensures that users' enthusiasm is maintained when using ICT tools?
2. In what way do you equip the school on proper document management as a way to attain the school's vision?
3. Elaborate the frequency of training of teaching staff on manual management?
4. Kindly explain the various sources of the funds used to equip ICT department?
5. Mention the procedures used to monitor and evaluate the school's ICT systems?

Appendix IV: Questionnaire

SECTION A: DEMOGRAPHIC INFORMATION FOR TEACHERS

1. What is your highest level of academic qualification?

   PhD ☐
   Masters ☐
   Degree ☐
   Diploma ☐
   Certificate ☐

2. How long have you worked in this school?

   More than 10 years
   8-10 years ☐
   6-8 years ☐
   4-6 years ☐
   2-4 years ☐
   1-2 years ☐
   Below I year ☐

SECTION A: DEMOGRAPHIC INFORMATION FOR STUDENTS

1. How long have you been a head-prefect/ captain in this school?

   3-4 years ☐
   2-3 years ☐
   1-2 years ☐
   Below 1 year ☐

SECTION B: ICT TOOLS IN KNOWLEDGE CREATION FOR MANAGING EXPLICIT KNOWLEDGE

No	Statements on Knowledge Creation	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
		1	2	3	4	5
1.	The school has quality knowledge creation practices through ICT tools					

2.	There is a department responsible for assessing the created knowledge utilized in the school through ICT tools					
3.	Availability of internet in the school has greatly influenced knowledge creation					
4.	There has been use of social media platforms and website to improve learning process in this school					
5.	There are frequent trainings by the management on teachers on how to cope with academic knowledge creation through ICT usage					
6.	There is a Science Technology Engineering and Mathematics (STEM) system in which students are encouraged to participate as a way to create knowledge					

SECTION C: ICT TOOLS IN KNOWLEDGE STORAGE FOR MANAGING EXPLICIT KNOWLEDGE

No	**Statement on Knowledge Storage**	**Strongly disagree** 1	**Disagree** 2	**Neutral** 3	**Agree** 4	**Strongly agree** 5
1.	There have been improved ICT tools put into place in this school archives to facilitate storage and retrieval of files and books conveniently.					

2.	The school is highly incorporating ICT tools to store soft copy data hence saving on storage costs					
3.	Management of stored books and files is limited to authorized personnel for accountability purposes					
4.	Students have accessibility to computers to be able to store notes and reading materials					
5.	There has been competitive advantage in this secondary school due to reliable knowledge management practices like libraries for effective storage.					
6.	There is an ICT tools periodic review on the efficiency of knowledge storage facilities such as reports, books and documents in the school					
7.	There are qualified personnel on ICT tools who ensure the school's database is functional and effective at all times.					

SECTION D: ICT TOOLS IN KNOWLEDGE SHARING FOR MANAGING EXPLICIT KNOWLEDGE

No	**Statement on Knowledge Sharing**	**Strongly disagree** 1	**Disagree** 2	**Neutral** 3	**Agree** 4	**Strongly agree** 5
1.	Emails have been a very significant way of sending and receiving assignments to and fro by teachers and students during covid-19 pandemic					

2.	The students are encouraged to share knowledge amongst themselves through social networks					
3.	The management has been sharing knowledge to teachers through training plans, workshops, seminars, direct talks and work-based studies					
4.	ICT tools such as g-mail and zoom have improved knowledge sharing awareness among teachers					
5.	Academic performance of the school has been improving due to efficiency in accessing shared knowledge.					
6.	The government has been offering financial support to boost and increase innovation on knowledge sharing through ICT tools					

SECTION E: ICT IMPLEMENTATION FRAMEWORK FOR MANAGING EXPLICIT KNOWLEDGE

No	**Statement on ICT Framework for Implementing explicit knowledge management**	**Strongly disagree** 1	**Disagree** 2	**Neutral** 3	**Agree** 4	**Strongly agree** 5
1.	The school has put up policies to facilitate easy accessibility of knowledge to every student including the disabled ones through ICT tools					
2.	The school staffs normally take initiatives					

	to implement on knowledge frameworks developed by the management					
3.	School board and senior school staff have a clear formality on how to develop and implement policies on explicit knowledge such as the one affecting teaching and learning					
4.	A review on frameworks is normally done periodically to facilitate assess whether the frameworks are working					
5.	There is a conducive school environment that promote in gaining, managing and innovating knowledge.					
6.	There is a periodic review on the current framework processes, structure, and ICT.					

SECTION F: EXPLICIT KNOWLEDGE MANAGEMENT

No	Statement on Explicit Knowledge Management	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
		1	2	3	4	5
1.	ICT tools such as e-learning systems in knowledge creation has improved explicit knowledge management in this school					
2.	ICT tools such as digital libraries in knowledge storage has improved					

	explicit knowledge management in this school					
3.	ICT tools in knowledge sharing such as g-mail, zoom and google meet has improved explicit knowledge management in this school					
4.	Having a reliable framework has improved explicit knowledge management in this school					
5.	Our school values support knowledge management					
6.	There is a clear and widely known way to manage information so that it greatly benefits the school					

Appendix V: Documents Analysis

	Secondary Schools	Year	Scope	Specificity	Depth	Type of data	Purpose
1.	School attendance monthly register	2018					
		2019					
2.	School rules and regulations manual	2018					
		2019					
3.	Board meetings minutes	2018					
		2019					
4.	Staff meetings minutes	2018					
		2019					
5.	Teaching notes	2018					
		2019					
6.	School time table	2018					
		2019					
7.	Curriculumn documents	2018					
		2019					

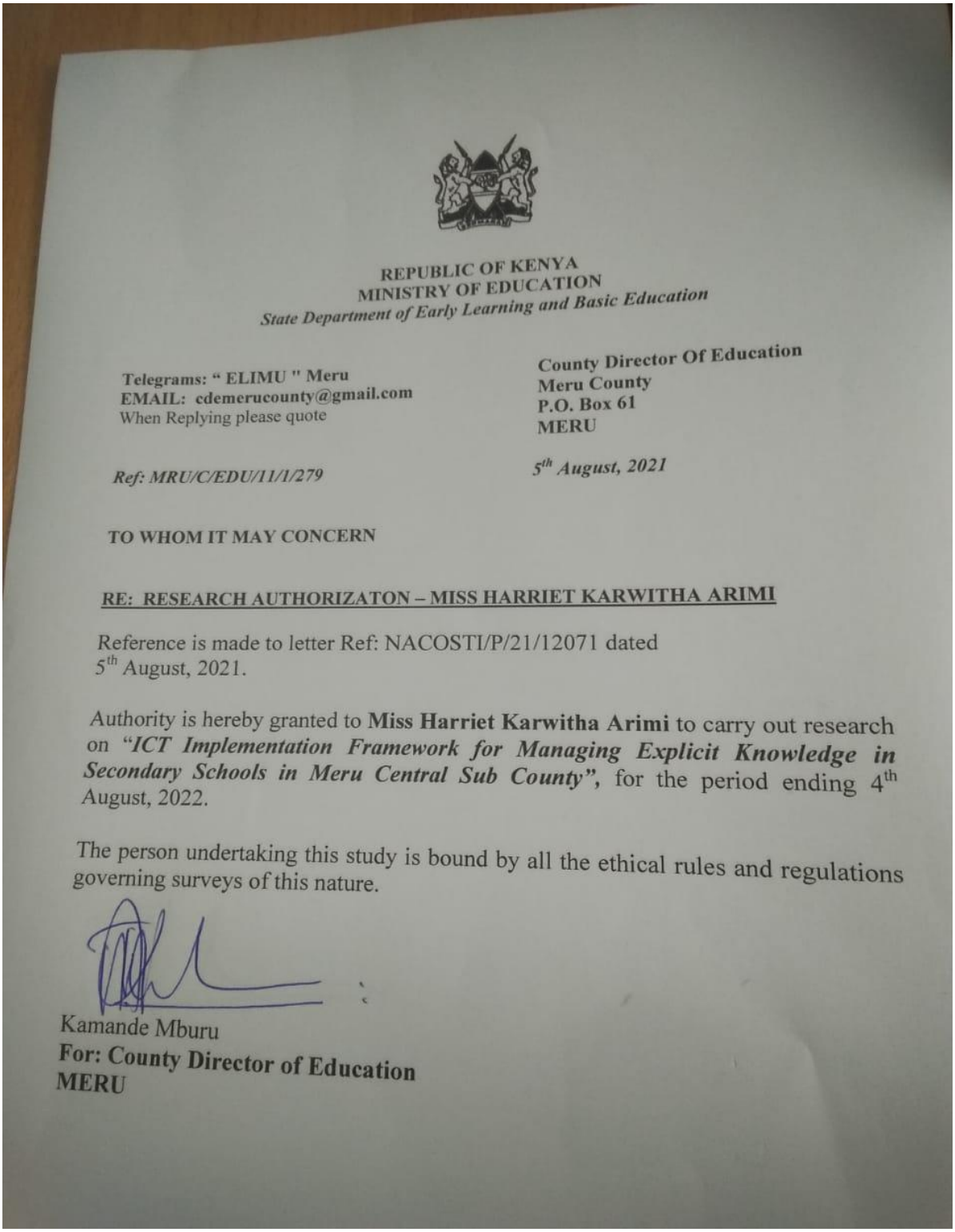
Appendix VI: Public and private secondary schools in Meru central sub-county

	Secondary Schools	Private or Public	Princpl	Teacher	Board Members	Head prefects/ captains	Total
1.	Githongo boys Sec Sch	Public	1	24	14	1	**40**
2.	Abothuguchi boys' Sec Sch	Public	1	28	14	1	**44**
3.	Katheri High Sch	Public	1	25	14	1	**41**
4.	Keeru Sec Sch	Public	1	19	14	1	**35**
5.	Nkando Sec Sch	Public	1	16	14	1	**32**
6.	Karugwa Girls High Sch	Public	1	26	14	1	**42**
7.	Kithirune girls' Sec Sch	Public	1	18	14	1	**34**
8.	Kirigara girls' Sec Sch	Public	1	18	14	1	**34**
9.	Ruiga girls' Sec Sch	Public	1	11	14	1	**27**
10.	Kinjo girls' Sec Sch	Public	1	16	14	1	**32**
11.	St Bonaventure mixed Sec Sch	Public	1	9	14	1	**25**
12.	Mukuune mixed Sec Sch	Public	1	7	14	1	**23**
13.	Ruiga mixed Sec Sch	Public	1	7	14	1	**23**
14.	Kinjo mixed Sec Sch	Public	1	5	14	1	**21**
15.	Kianthumbi mixed Sec Sch	Public	1	4	14	1	**18**
16.	Kaguma Sec sch	Public	1	7	14	1	**21**
17.	Kathiranga Sec sch	Public	1	10	14	1	**24**
18.	Gaokene Sec Sch	Public	1	8	14	1	**24**
19.	Kirirwa Sec Sch	Public	1	5	14	1	**21**
20.	Murathi Sec Sch	Public	1	9	14	1	**25**

21.	Gaitu Sec Sch	Public	1	10	14	1	**26**
22.	Nyweri Sec Sch	Public	1	5	14	1	**21**
23.	Rwanderi Sec Sch	Public	1	4	14	1	**20**
24.	Tabata Sec Sch	Public	1	4	14	1	**20**
25.	Gacuru Sec Sch	Public	1	4	14	1	**20**
26.	Ntugi Mixed Day Sec Sch	Public	1	7	14	1	**23**
27.	Muthangene Day Sec Sch	Public	1	10	14	1	**26**
28.	Mariene Mixed Day Sec Sch	Public	1	8	14	1	**24**
29.	Muri Mixed Day Sec Sch	Public	1	9	14	1	**25**
30.	Gakando Girls Sec Sch	Public	1	9	14	1	**25**
31.	Mugambone Sec Sch	Private	1	8	14	1	**24**
32.	Mwanganthia Sec Sch	Public	1	10	14	1	**26**
33.	Ntonyero Mixed Day Sec Sch	Public	1	3	14	1	**19**
34.	Kiria Mixed Day Sec Sch	Public	1	2	14	1	**18**
35.	Kinjo Mixed Day Sec Sch	Public	1	5	14	1	**21**
36.	Mukuune Mixed Day Sec Sch	Public	1	7	14	1	**23**
37.	Murinya Mixed Day Sec Sch	Public	1	4	14	1	**20**
38.	Kithirune Mixed Day Sec Sch	Public	1	9	14	1	**25**
39.	Ruibi Mixed Day Sec Sch	Public	1	4	14	1	**20**
40.	Ntumburi Day Mixed Sec Sch	Public	1	6	14	1	**22**
41.	Mbwinjeru Mixed Day Sec Sch	Public	1	3	14	1	**19**
42.	Mucheene Sec Sch	Public	1	10	14	1	**26**

43.	Kiamuri Day Sec school	Public	1	3	14	1	**19**
44.	Nthimbiri sec school	Public	1	14	14	1	**30**
45.	Mpuri mixed day school	Public	1	6	14	1	**22**
46.	ACK St pauls makandune	Private	1	8	14	1	**21**
47.	Kainginyo mixed day school	Public	1	5	14	1	**21**
48.	Kathiranga mixed day school	Public	1	10	14	1	**26**
49.	St. Martins Boys high school	Private	1	7	14	1	**23**
50.	St. Theresa Riiji Sec sch	Private	1	5	14	1	**21**
51.	Muujwa girls' sec sch	Private	1	6	14	1	**22**
	Total		**51**	**477**	**714**	**51**	**1293**

Appendix VII: Authorization Letter from Sub- County Education Director- Meru County



REPUBLIC OF KENYA
MINISTRY OF EDUCATION
State Department of Early Learning and Basic Education

Telegrams: " ELIMU " Meru
EMAIL: cdemerucounty@gmail.com
When Replying please quote

County Director Of Education
Meru County
P.O. Box 61
MERU

Ref: MRU/C/EDU/11/1/279

5th August, 2021

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATON – MISS HARRIET KARWITHA ARIMI

Reference is made to letter Ref: NACOSTI/P/21/12071 dated 5th August, 2021.

Authority is hereby granted to **Miss Harriet Karwitha Arimi** to carry out research on ***"ICT Implementation Framework for Managing Explicit Knowledge in Secondary Schools in Meru Central Sub County"***, for the period ending 4th August, 2022.

The person undertaking this study is bound by all the ethical rules and regulations governing surveys of this nature.

Kamande Mburu
For: County Director of Education
MERU

Appendix VIII: Introduction Letter from KeMU

KENYA METHODIST UNIVERSITY
P. O. Box 267 Meru - 60200, Kenya
Tel: 254-064-30301/31229/30367/31171
Fax: 254-64-30162
Email: deanrd@kemu.ac.ke

DIRECTORATE OF POSTGRADUATE STUDIES

July 15, 2021

Commission Secretary,
National Commission for Science, Technology and Innovations,
P.O. Box 30623-00100,
NAIROBI.

Dear sir/ Madam,

ARIMI HARRIET KARWITHA (MCS-3-0614-1/2015)

This is to confirm that the above named is a bona fide student of Kenya Methodist University, Department of Computer Science , undertaking a Degree of Master of Science in computer Information Systems. She is conducting research on, **"ICT implementation Framework for managing explicit knowledge in Secondary Schools in Meru Central Sub-County.**

We confirm that her research proposal has been defended and approved by the University.

In this regard, we are requesting your office to issue a permit to enable her collect data for her research.

Any assistance accorded to her will be appreciated.

Thank you.

Dr. John Muchiri, Ph.D.
Director Postgraduate Studies
Cc: Dean SST
COD, CIS
Postgraduate Co-ordinator
Supervisors

Appendix IX: Nacosti Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **579673**

Date of Issue: **04/August/2021**

RESEARCH LICENSE

This is to Certify that Miss.. Harriet Karwitha Arimi of Kenya Methodist University, has been licensed to conduct research in Meru on the topic: ICT IMPLEMENTATION FRAMEWORK FOR MANAGING EXPLICIT KNOWLEDGE IN SECONDARY SCHOOLS IN MERU CENTRAL SUBCOUNTY. for the period ending : 04/August/2022.

License No: **NACOSTI/P/21/12071**

579673

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

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