UNIVERSITY OF NAIROBI

COLLEGE OF BIOLOGICAL AND PHYSICAL SCIENCES

SCHOOL OF COMPUTING AND INFORMATICS

Digitization Readiness Assessment in Public Organizations
A case of Kenya National Examinations Council

BY

LEAH WANGARI KIRATU

(P54/6451/2017)

SUPERVISOR: Dr. SAMUEL RUHIU, PhD

A Research Project Report Submitted In Partial Fulfilment of the Requirements for the Award of Master of Science In Information Technology Management, School Of Computing And Informatics, University Of Nairobi.

August 2020

Declaration

This is a declaration that this study has never been submitted to any university or approved for any award of a degree. This is a unique research except where reference is made.

Registration Number P54/6451/2017

Leah Wangari Kiratu

Signature-..

Date-............04/09/2020..

Approval

The dissertation of Leah Wangari Kiratu was Supervised and Approved by:

Dr. Samuel Ruhiu:

Signature-.. Date-..6/9/2020.

School of Computing and Informatics,

University Of Nairobi

Kenya

Acknowledgement

Heartfelt gratitude to my employer, Kenya National Examinations Council for giving me time to study. Indeed this was a kind gesture from my employer without which my studies would have been strenuous.

My special thanks goes to Dr. Samuel Ruhiu, my supervisor without whom I would not have endured through the tough journey of a master's program. I wish to particular commend your dedication to timely correction and encouragement you gave me, even when things seemed difficult.

To my colleagues at KNEC, Special thanks to you all. Without you, I would not have been able to collect data. I appreciate my Supervisor at KNEC Mr. Kedera. You encouraged and most importantly, gave me time to study when I needed it.

Finally, I want to thank one very special person to my life. My dear Husband Leonard for being a great peer reviewer and sacrificing a lot during this study.

Dedication

This research project is a dedication to my family, my beloved husband Leonard Wekesa and our dear daughters Emily, Eva, Jacky and Joan who endured my absence during my study. To my parents for their constant encouragement to pursue my dreams and for helping become who I am today.

Table of Contents

Table of figures

List of tables

Abstract

An education system geared towards critical thinking, problem solving and lifelong learning is an important part of the innovation ecosystem. The examination process is an important indicator of learning outcomes. In Kenya, examinations are managed by Kenya National Examination Council (KNEC), who are required to provide accurate and timely examination information to education stakeholders, including candidates, schools, curriculum developers, and education policy makers. This is hampered by information held in hardcopy documents that poses a challenge to access, search, dissemination and analysis. A number of attempts to digitize existing documents have not been successful.

The research is purposed to come up with a digitization readiness model to assess the preparedness of KNEC and by extension other public organizations towards undertaking digitization. After reviewing theory on e-readiness and digitization of organizations, the study developed a digitization readiness assessment model (DRAM), which included organizational, IT governance, competency, technology and ICT security readiness indicators. The model was then validated through a survey at KNEC.

Through a quantitative survey, the study sought to establish the preparedness of KNEC to carry out digitization. Purposive sampling targeting a population of 100 respondents was done. A questionnaire was the main data collection instrument, while data analysis was by use of frequencies, descriptive analysis and Principal Component Analysis.

The analysis established an aggregation of success factors along three components; most critical, critical, and less critical/supportive. The study reveals that the most critical indicators address governance of ICT projects, critical indicators addresses control measures of the same while less critical factors are supportive. The emergent digitization (preparedness) index for KNEC was found to be 2.88, on a scale of 1 to 4, where 2.5 is the minimum expected level of readiness. A critical look however at the individual indices that aggregate this score shows weakness in some of the factors associated with the "most critical" axis. These are competency readiness and Organizational Readiness.

The study concludes that Digitization Readiness Assessment Model is useful to managers of public organizations, for decision-making and recommends sector wide approach towards digitization as a way to optimize resources.

List of Abbreviations and Acronyms

ICT-   Information and Communications Technology

KNEC-   Kenya National Examinations Council

NCEOP-   National Committee on Educational Objectives and Policies

COBOL-   Common Business Oriented Language

SQL-   Structured Query Language

DRAM-   Digitization Readiness Assessment Model

GMCT-   Greater Metropolitan Cemeteries Trust

CSPP-   Computer Systems Policy Project

ITU-   International Telecommunications Union

ICT-OI-   ICT Opportunity Index

CMM-   Capability Maturity Model

PCMM-   People Capability Maturity Model

IPMM-   Industrial Process Maturity Model

CERAM-   Construction Engineering Readiness Assessment Model

BEACON-   Benchmarking and readiness assessment for concurrent engineering construction

CICE-   Centre for Innovative Construction Engineering

TRM-   Technology Readiness Model

KENET-   Kenya Network

CID-   Center for International Development

ISACA-   Information Systems Audit and Control Association

CIA-   Confidentiality, integrity, and availability

EA-   Exam Administration

TD-   Test Development

CEO-   Chief Executive Officer

SPSS-   Statistical Package for Social Scientists

1.0   INTRODUCTION

Expansion of Information and Communications Technology has experienced the rise of digital firms and organizations. As an enabler of new opportunities, ICT has created new social practices and communication channels in a digitally connected world. Increasingly we witness economies turn into e-economy and businesses turn into e-business. Nevertheless, as ICT plays a central role in transforming organizations and generating new opportunities. Carr, (2003) through an article titled "IT doesn't Matter" predicts that Information Technology (IT) innovative competitive advantage is long gone. Moreover, that opportunity for gaining IT-based advantage is limited since IT has become common, like any other infrastructures such as roads or railways. This kind of criticism has led organizations to become keen to monitor Information Technology (IT) initiatives with view of ascertaining progress made in realizing new opportunities enabled (Mia and Dutta, 2007).

For many businesses firms and government agencies, one key challenge is how to identify the requisite preparedness that enables one to leverage IT optimally. Organizations have attempted through benchmarking with peers. However, it also presents challenges. For instance, how to gain relevant knowledge based on experiences of similar firms whose ICT development and deployment programs may differ considerably from your course. Today's organizations take different trajectories for ICT development. It is argued therefore that, firms tend to align ICT deployment to very specific business goals. With a variety of approaches, that firms use for ICT deployment this renders benchmarking complex and in accuracy as a source of information is therefore not flawless (Mia and Dutta, 2007).

1.1   Organizational E-readiness

Against this backdrop, organizations consider e-readiness as a means that would provide measurement towards preparedness to optimize ICT projects. E-readiness has been identified as critical to the development and upgrading of digital systems within an organization. This is because of the ease with which it assesses the relative advancement in achieving critical investment in ICT and the impact on business objectives Hartman et al (2001); Molla and Licker, (2005). Furthermore studies have it that that e-readiness can predict ICT outcomes if properly undertaken Kashorda and Waema, (2014). E-readiness as a measurement has been used to evaluate ICT investments in regards to the worth of services given. Kashorda and Waema, (2014), indicates that the degree of correlation is high between e-readiness and institutional goals. In addition, e-readiness can define how an organization or community is ready to contribute in the information age. Further, that e-readiness measurements gauge organization relative advancement in most critical ICT adoptions and their alignment to quality of

services offered. Similarly, e-readiness assessments are seen as critical to not only align ICT investment services and operations but also achieving strategic goals (Abdel and Khairalla, 2007)

At country level, many governments across the world have conducted e-readiness to measure improvement in internet connectivity. These studies emphasize increased automation in delivery of public services. At this instance, Government agencies are encouraged to invest towards digital integration. Moreover, if ICT infrastructure, software applications and other e-applications are continually being upgraded government services are likewise improved. This then enhances transparency and accountability (Kettani and Moulin, 2014). In Kenya, the vision 2030 considerably increase the role of ICT as a major contributor to her development agenda. Ministries, like that of ICT and Interior are currently integrating their services to facilitate efficient and effective services. However, the success of ICT automation investments may require tools that are good enough to measure and accurately forecast outcomes that are yet to be realized.

1.2   Study Background

Several e-readiness assessment studies have been carried out Oztemel and Korkusuz, (2006); Molla and Licker, (2005); Kashorda and Waema (2014); Idris,(2015); Al-Omari and Al-Omar,(2006). Each of which recommend different tools for e-readiness measurements at both Country level and firm level. The diversity of these tools require further investigation to ascertain their applicability. The main drive for these studies has been traditionally to increase transparency, accountability and accessibility to information. This study took a different view from the traditional focus since it underpins the role of e-readiness studies on improving ICT project management in government agencies, specifically the Kenya National Examination Council.

1.3   Kenya National Examination Council (KNEC)

KNEC would wish to integrate data to the National e-government portal. The compelling reason being the need to improve public access to information. That includes but not limited to exam releases, registration of candidates, information related to contracted professionals that it engages from time to time. As enshrined in Kenya constitution 2010, that supports citizen right to information.

This right to information has been a dilemma to KNEC. Partly because, as an organization mandated to carryout summative assessments nationally, it has long history of record keeping. The history of the organization dates back to 1977, when East Africa Community collapsed. National Committee on Educational Objectives and Policies (NCEOP, 1976) was established adding responsibilities for KNEC that included setting standards for evaluating qualifications gained outside Kenya and equating this to the local grading system.

In undertaking these responsibilities, KNEC has generated voluminous examination data, through processes such as student registration and examination processing. Data has also become complex over time that, data now exists in different formats that are not communicable to each other. This makes information retrieval difficult. Examples of existing diverse formats include hard copy documents, microfilm tapes, Common Business Oriented Language (COBOL) system files, unstructured databases and text files.

Accordingly, Hu, Wen, Chua and li, (2014) technology changes has also affected data management. As data processing techniques rapidly evolve, full migration of data does not occur in some instances. Over the period technological improvements necessitates changes in data and information processing, such as, changes from hard copy, microfilms and Business Oriented Language (COBOL) system files to the present Structured Query Language (SQL). These changes present KNEC with diverse data systems that require consolidation for better management. One way to consolidate data is to digitize the hardcopy documents and microfiche films tape into an electronic database that are portable or interoperable. If this were to happen then KNEC would greatly support Government initiative like 100% transition from basic education to secondary. KNEC would quickly provide requisite information and broaden access to examination records.

This study was necessitated by prior attempts to digitize hardcopy records and other records that were not in harmony with existing data structure standards. These attempts were not entirely successful. Unfortunately, no study was undertaken to understand these failures and possible remedies that help future initiatives. It was the intention of the study to uncover procedures and factors to consider in making such undertakings successful.

This research therefore, investigated factors that can be measured to ascertain digitization readiness. It hope to create framework for digitization readiness index for examination bodies. Such an index can guide bodies like KNEC manage her ICT investment priorities. This study hopes to make great support to existing e-readiness body of knowledge by looking at the subject from the context examination records.

1.4   Problem Statement

KNEC is under pressure, from the public, because of legal requirements that emanate from the new constitution. The new constitution, 2010 for Kenya, has given the public right of access to information. Under the same, KNEC is required to provide accurate and timely information. For instance, KNEC is required to offer speedy resolution for a variety needs such as election disputes, confirmation of the

genuinely acquired certificate, and replacement of lost certificates to the rightful owners. Yet with the current situation where millions of these documents are in hardcopy, KNEC is not adequately prepared to resolve these needs in timely manner.

Let us look at the status of records in the current situation. Some records date as far back as seventy years. The records that are stored as hard copy printouts or microfiche tapes are fading due to time and repeatedly being flipped. Faded records make resolution of client needs an uphill task. For instance, replacement of certificate requires one to reconstruct data. The implication is a likelihood of errors of omission or commission. This not only pose a serious threat to the security and integrity of the existing data but also could cause the public to lose confidence in the record keeping of KNEC.

While digitization offers a possible solution to this, lack of knowledge may hinder the undertaking especially it is on a huge scale that involves millions of records. According to Provost and Fawcett, (2013) data driven decision involves principles, processes, and techniques for understanding a phenomenon. The limitations caused by absence of reliable and relevant studies in this arena might hinder digitization processes in Kenya, a country that aspires to offer leadership in technology evolution in the region. This study wished to fill this gap by investigating factors for readiness that ought to be considered for successful digitization in a state owned corporations charged with managing examinations records.

1.5   Scope

This research is a case for Kenya National Examinations Council. The aim was to identify factors that support success in digitization. This in turn aided the study undertaken critical analysis and proposed a Digitization Readiness Assessment Model (DRAM) for examination bodies. This model would be a de-facto instrument that guides outcomes of digitization process for kind organizations. Consequently, the study tested its applicability.

1.6   Research Objectives

This study focused on gauging the level of preparedness in digitization. Reviewed literature on the success factors that forms the basis of creating a Digitization Readiness Assessment Model (DRAM) for examination bodies. In summary, this study:

1. Reviewed the success factors elements for digitization readiness.
2. Developed digitization readiness assessment model (DRAM).
3. Tested the validity of the digitization readiness model
4. Developed KNEC digitization e-readiness index

1.7 Research questions

1. What are the success factors that contributes to digitization e-readiness?

2. What model was suitable for digitization e-readiness assessment?

3. How appropriate is the proposed model for measuring digitization e-readiness?

4. What is the digitization readiness index for KNEC?

1.8 Significance

Measurements for digitization readiness are important yet hardly available from the literature. Already KNEC's attempted project to transform hardcopy records into electronic records, though seemingly straightforward, did not succeed. Yet if all hard copy documents were digitized, they would become easily portable to other forms. Benefits of this includes elimination of silos of data that currently exist. In addition, there can be reduction in storage space and risks that emanate from handling hardcopy documents. This automatically results into savings from warehousing rent.

Thus, this study perceived itself as a step that will greatly contribute towards the management of digital projects in government agencies like KNEC by developing a Digitization Readiness Assessment Model (DRAM) for examination corporation's bodies that are state owned. The study believes that such a model may apply to many other sectors like ministry of lands and academic institutions.

Additionally, the study brings knew knowledge by looking at digitization readiness assessment from ICT projects management point of view.

2.0   LITERATURE REVIEW

2.1   Digitization

Digitization has been widely adopted as a means of converting paper based records into digital format. This is grounded on the possibilities that digital records are easily manipulated, and more accessible. From the literature, a good number of studies look at digitization from the point of academic libraries Namande, (2010); Nyakundi (2012)). Others Weiss & James, (2013) look at digitization from the perspective of managing records that are converted from paper based for preservation. For instance, Books in Google being the largest digital libraries in the world, have limited number of metadata records with full-text searching . Accordingly therefore not fully considered digitized. On the other hand, Lampert and Vaughan (2009) enquires about the factors that promote digitization of libraries and those that do not. One of the key areas they discuss is the Technical Web design expertise for cataloging. Their study suggests that planning software activities for both back and front end was important. In addition, digitization efforts occur in a wide variety of configurations and involve large number staff ranging from volunteers to staff engaged on long term within the organizations. They argue that focusing on management of staff could yield desired results. For example creating a unit dedicated to metadata standards achieves better results within organizations as opposed to spreading this responsibility across many departments.

2.2   Challenges of Digitization

At the local scene, Kenyan companies face many challenges while trying to digitize documents. A study by Sigauke, &Nengomasha,(2012) indicates that this also has been experienced in Zimbabwe. Joseph Wang'ondu Kariuki, (2018) concur that challenges that face digitization projects in Kenya are similarly experienced in many Africa countries. Such as:

1. Funding: Bailey-Hainer and Urban, (2004) established that one of the main problems for digitized project is funding. Funds are needed for acquisition of ICT infrastructure and training of employees. The study reported that many digitized project depended on internal funding mainly from government. Due to low budgetary allocation, many projects run behind schedules.

2. Lack of technical expertise: Digital transformation brings along organizational challenges where it needs to bring on board those people who have technical skills. If Staffs are not well equipped with the technology, organizations require to train workforce or outsource the services.

3. ICT infrastructure: previous study revealed that equipment poses high challenge to the implementation of digitization project. The finding is attributed to lack of funds to acquire

modern ICT equipment or poor tendering process experienced in most government tender awards. Liu, (2004), found that use of obsolete or unreliable equipment might affect digitization process by providing low quality images, a challenge in many digitization projects.

4. Change Management: The traditional cultural values of hierarchy in public organizations and bureaucracy, may affect digitization.

5. Poor leadership in an organization: Governance is one of the central driving forces of every project initiative. Leadership that is gifted to realize the actual expenses and paybacks of the project, is required Ndou, V., (2004). However, due to lack of understanding of what it means by benefits of adopting ICT, the management do not put the full efforts required.

2.3 Digitization Success and Failure Factors

The status of archiving and accomplishing an objective for any project is the Success of achievement of desired visions and planned goals. Project success may be influenced significantly by how prepared organizations are, before the project begins. Digitization in KNEC is measured through a process. Where the e-readiness weighted to give the level at which KNEC is in terms of preparedness in order to reduce failure.

A study by Gichoya,(2005). shows that poor planning and management of ICT projects has been experienced in less developed countries This has been elaborated more by Wiley, (2017) where the study emphasis on careful review of reasons for digitization need to be clear and proper goals set before digitization is done. He identifies that success factors of a project is determined by presence or absence of a factor. The researcher indicates that beneficial output variables can be achieved if the initial stage succeeds. This also helps to determine how to move the project to the next stage. In addition, key variables and reasons for digitization failure are reviewed.

Cost reduction and Quality of service are the key variables that benefits the organization and improve value for digitization. Gichoya, D. (2005), indicates that it is necessary to clarify opposite effect of success and failure factors. Heeks,(2004) on the other hand looks at factors for success as driver or enablers to digitization. He further explained that in order to overcome barriers in the society, effective project coordination and change management are best practice for digitization success.

Aineruhanga, (2004) on the other hand defines failure factors as occurrences that limit smooth projects implementation. Some of these factors for failure are listed below.

• Poor Infrastructure

- Lack of Finance
- Lack of system compatibility.
- Lack of skilled personnel
- Bureaucracy in Leadership styles
- Negative Attitudes

More literature has been re viewed and it shows that where economic terms drive organizations to digitize, especially public ones, a process results in improving the quality of service to the citizens. And that this is realized through improved access to knowledge and awareness as a direct result to lower access costs (Amit &Zott, 2001). This is further collaborated by El-Darwiche & Singh, (2013), where he looked at success factors in terms of profit where transactional operations becomes more efficient leading to reduction of the associated costs. According to Roman F, (2013), the impact of such digitization differs from one industry to another. On the other hand, Joseph Kariuki,J. (2018),states that government agencies success in digitization is influenced by budgeting and proper planning.

A study by Vrana, (2011), suggests that, to successfully undertake digitization, employees need to be trained for digitization. On the other hand, Saima Khan, (2015), looks at digitization in a social perspective where he relates digitization link to overall Societal welfare to the process. In addition, digitization enables institutions to create benefits to society through enhanced relationships. He gave some of the benefits that citizens realize through digitization that includes; access to digitized online items, where institutions enable the users all over the world to view information at different times and in different time zones. Dharmesh Patel, (2018), who suggests that users, through digitization, no longer need to invest much time and money to visit the physical location for services, further emphasizes this.

A study done by Yakel, (2004) indicates that Project leadership is the key important where Management fall under organization infrastructure like enabling policies, technologies, finance, expertiseem, and long-term commitment of management. Choudhury, (2003) looks at deployment of digital assets by management influence the success greatly by setting organizational quality standards that must be met before hand. In addition, management must set standards that include copyright observation and product quality aspects through the entire lifecycle before initiating digital project to realize fully sustained future benefits. Further, that documentation of standards and best practices must be upheld throughout the project period.In addition, a clear plan for digitization process must include required standards (Tomomi Kameda, 2012).

A study by Wausi and Waema, (2010) which focuses on implementing of IS in Developing countries indicates that management intervention and change management are the key factors which enables success. He further adds that, for a process to be successful there is need to understand, the context within which it occurs. The researcher further indicates that, organizations require continuous change management mechanisms and continuous action in response to changed outcomes associated with IS implementation .planned and unplanned changes are associated with continuous interaction with technology and the social context. Additionally, the study indicates that lack of knowledge and resources are evident challenges when adopting new technologies. Organizations need to train their own staffs or hire staff with the appropriate skills for a project to succeed.

Khan, (2018): Subiyakto and Ahlan, (2013): indicates that, ICT success is context dependent and it implies different things to different people. For example, Subiyakto and Ahlan ,(2013), identify gaps around ICT project success as; project failing in high rate, unclear project definition, use of changed project scope, and use of altered critical success factors identification methods.

Emam & Koru, (2008) analyzed cancellation of ICT projects as one of the failure factors experienced. He concludes that success of ICT projects should be associated with less likelihood of cancellation. Moreover, lack of cancellation of ICT projects in itself is a success. Consequently, he developed a framework that shows highly ranked cancellation factors of ICT projects. Accordingly, the presence of highly ranked cancellation factors significantly increases probability of failure. The highly ranked factors were; not involving senior management, too many requirements, management not having necessary skills, budgets going overboard and lack of necessary technical skills among others. Khan (2018) indicates that success of ICT project is met when an aim or objective has been achieved and accomplished. Atkinson (1999) concludes that to succeed in ICT project, there should be three fundamental criteria to consider. time, cost, and quality.

Ambler, (2006), who points that ICT projects often fail because organizations set unrealistic goals, emphasizes iron triangle framework. For the "Iron Triangle", the development teams often fail to negotiate "the favorable situation" forcing them to undertake projects under constraints. Success of ICT projects should be associated with how conflicting priorities of scope, resources and schedule are managed. Different stakeholders in the project advance these priorities. For instance, different stakeholder interest either support project implementation or suppress. While IT professionals, from the perspective of iron triangle, could be interested in attributes that lead to highest quality of a system, stakeholders from finance are more interested in the overall cost of the project. The same triangle

suggests that role of senior management in the project is to control the activity schedules which can be against end users wishes keen on the scope.

According to the iron triangle concept, three critical factors are scope, cost, and time for an ICT project to succeed.

2.4   Failures of Digitization

Kenya National Examinations Council (KNEC) has generated voluminous examination data over a long period through processes such as student registration and examination processing among others. KNEC examination data is stored in many formats such as, hard copy documents, microfilm tapes, Common Business Oriented Language (COBOL) system files, unstructured databases and text files. Digitization motivates this study given the sheer volume of hard copy document that exist at KNEC stores and desire to improve service delivery to the public.

As part of her previous attempts, KNEC through an outsourced firm tried to digitize all her hard- copy records in the year 2010. While the contract documents show all the works were described and agreed to. There is little evidence to show the exercise succeeded. Among the undertakings the contractor was obliged to do was; supply all the necessary equipment, commission and implement the services as provided in the schedules. The challenges that was associated with the digitization hard copy records at KNEC were later discovered that lack of ability, capacity, and preparedness led to the failure of digitization project.

This requires that a study be undertaken before implementation to determine digitization readiness of KNEC.This study fills the gap by investigating readiness to successful digitization project in examination records as a case study at KNEC. Based on this, the study wished to create digitization Readiness assessment Model (DRAM) for examination bodies that can guide on readiness for a successful digitization project to reduce risk and offer prioritization of ICT investments for such organizations.

2.5   The Need for Digitization in KNEC

The mandated organization in Kenya, to carryout summative assessments at basic education level is Kenya National Examinations council (KNEC). This mandate was effected after the collapse of the East African Community in 1977. After promulgation of the new constitution 2010, ACT NO. 29 of 2012 reviewed the Kenya National Examination Council mandate. Some of the changes brought about include but not limited to allowing the right to information by citizens.

This has serious implications to KNEC, especially where under article 35, the public can sue an organization for lack of access to information. Article 35(1) particularly guarantees all Kenyan citizens the right to access any information held by the state or information held by another person and required for the exercise or protection of the fundamental freedom. For instance, in a report that appeared in a local daily " the Daily Nation of December 21st 2017' an activist's Okiya Omtatah went to court seeking to compel KNEC to make public marked answer sheets to schools.

Increasingly, KNEC has come under pressure, from legal requirements and natural calamities to provide timely access to records and information under her custody. Examples of recent cases are the fires experienced during post-election and floods, like the one of Solai dam in Nakuru town that led to the public loosing critical exam related documents like certificates. Such calamities, ordinarily, lead to increased requests for replacement and verification of documents by KNEC.

This pressure is further compounded by the public, which demands for better services and the constraint of government budget. As a result, digitization of hard-copy documents, which are in millions, is seen as possibility that can assure the public faster services at low budgets. This, however, is hampered by current state of the un-digitized hard copy records. Keeping the records in hardcopy records is risky in case of fire or any natural calamity.

.

Figure 2.5-1 Hard-Copy Storages

Clearly, figure2.5.1 shows that newer records are fairly well kept as seen from the arrangement in while those that are older are in sorry state. Accordingly, requests related to data stored in figure2.5.1

would be easier to retrieve while those associated to older records would be extraneous within the same period. Meaning that KNEC is likely to offer different service experience to her customers depending to where the records fall. To counter failure of digitization as earlier experienced, KNEC require carrying out digitization e-readiness to check the level of preparedness to transform hardcopy documents into digital records.

2.6 E-readiness

for an institution or organization to enhance the quality of services in using ICT, measuring e-readiness is important to check on preparedness level. A high level of preparedness also contributes considerably towards recognitions of organizational goal (Kashorda & Waema, 2014). Preparedness guides improvement energies by providing targets for monitoring progress. Abdel& Khairalla, (2007.) defines E-Readiness as the point to which an organization or community is willing to contribute in the information age. It is measured by assessing an organization's relative progress in the areas that are most critical for ICT adoption and the most important applications of ICT.

A study by Choucriet et al., (2003), points out that e-readiness is a new concept that has been pushed due to the extreme use of ICT and mostly the fast rate of Internet penetration throughout the world. He therefore defines it in relation to physical infrastructure in a society that has the necessary and a strong legal, policy and regulatory framework. On the other hand, Bose, (2004), defines e-readiness as "the degree to which a country is prepared to participate in the networked world by assessing its advancement in areas that are most critical to the adoption of ICTs". Greater Metropolitan Cemeteries Trust (GMCT) defines e readiness as the extent to which readiness is, to access connectivity technologies. While Economist Intelligence Unit (2009) defines it as a measure of the quality of a country's ICT infrastructure and the ability of its consumers, businesses and governments to use ICT to their benefit.

For this study, preparedness is measured to gauge degree to which KNEC is ready to undertake digitization project in a timely manner within cost budget. This measure will estimate the status of KNEC in relation to undertaking digitization projects and therefore take advantage of the benefits presented by it in order to preserve records and inform management on ICT investment priorities on the project.

2.7 Historical Background of E-Readiness

The intention of developing a unified framework to assess breadth and depth of the digital divide between more and less developed countries, originated during the latter part of 1990's (Mutula & van Brakel, 2006). In 1998,establishment of the earliest definitions of e-readiness was done by Computer

System Policy Project(CSPP) during the development of the first e-readiness assessment tool generation by guiding to live in the networked world (Mutulaa & Brakel, 2006). During the latest1990s, e-readiness concept was found for framework coverage of ICT infrastructure. Indices and indicators took in crystallization to evaluate e-readiness and compare e-readiness of different countries (Lanvin & Qiang, 2004). As the world experience global growth of e-readiness, some countries in the developing world are still implementing infrastructures to achieve high levels of e-readiness that are enough to contribute in the emerging global information economy Lou, (2010).

2.8   Importance of E-Readiness

A good sign that a country is developing is when E-readiness is measured, that creates a podium for dissemination of facts from old methods to new improved channels. For an organization to be transformed, scientific methods of thinking and choice analysis must be employed for better decision making. In Creation of economies that create high level of employment, human capital and better leadership, ICT is concerned. In addition, adoption of ICT in the business environment is also a source of competitive advantage by establishing the way businesses and organizations interact with stakeholders including suppliers, employees, investors, and customers. From the political and social perspective, e-readiness allow citizens to share personal experiences with the world as well as empower them to participate in policy-making by giving voices to those excluded from the society.

2.9   E Readiness Assessment Tools

The level of infrastructure development has been measured by E-readiness assessment tools, which shows level of connectivity; Internet access; applications and services. Stephen M. Mutula, (2010) indicates that each of these tools uses a different definition of e-readiness and methods for its measurement. On the other hand, goals, strategies and results are very diverse in their e-readiness assessments Bridges.org, (2003). At country-level, across a number of sectors, largely adopts quantitative approaches in investigating E-readiness assessments and tend to that assign countries' numerical scores depending on how well they perform on specific components of e-readiness as a measure of e-readiness of countries (Rizk, 2004).

ICT readiness assessment model is a tool that evaluates and measures level of an organization state of ICT utilization. The model provides frameworks and critical indicators, derived from macro perspective models. It proposes essential indicators, which can be associated with critical ICT development of an organization. The indicators are used to declare the ICT readiness of an organization (Chanyagorn and Wael, 2011). E-readiness is a vital tool for judging the impact of ICT, to replace wild claims and anecdotal evidence about the role of ICT in development with concrete data for comparison (Khairalla and Wael, 2011).

Macro E-Readiness Assessment Tools also can measure the ICT training programs in place, Adequacy and availability of human resources, Level of computer literacy and Relevant content

2.10   Digitization Readiness

Digital readiness refers to the ability for organizations to take on large-scale digital initiatives Sánchez, Marisa A. (2017). Other core components of digital readiness include people and skills, specifically how capable people are, using technology. To review the readiness of an organization for adapting to the digital transformation, it is necessary to consider research about key elements for successful product development. A high degree of e-readiness also contributes significantly towards the realizations of an institutional goal (Kashorda & Waema, 2014). E-Readiness assessment is meant to guide development efforts by providing benchmarks for comparison and gauging progress.

Research papers and empirical works reflect Digital transformation as an emerging topic of interest and it forms basis of organizational strategy. In order to generate value from technology It is necessary to make an exploratory regional study to understand the local environment, barriers, and required conditions.

2.11   Need for Digitization Readiness in KNEC

Before embarking on digitization project, it is significant to check the level of preparedness of an organization. Transforming hardcopy records into electronic records can preserve records and enable complete data Integration. This can eliminate the various silos of data that exist at KNEC.

The major challenge in digitization is failure to deliver projects on time and within budgeted costs. Digitization may not be optimal if there is no E-readiness assessment carried out to ascertain the preparedness of KNEC to carry out conversion of hardcopy documents to digital records. Readiness assessment helps to ascertain the true picture of preparedness, answering why the organization is in a particular state.

For e-readiness to be successful, the organization prepares the whole team involved through training and by management leading by example. In Developing countries, leaders are requested to use e-readiness as a measure to identify areas of integration, focusing efforts within and without, where external efforts are required. (Darren & Rembrandt, 2005). Policy makers, face a chronic shortage of resources, particularly in developing countries, however, they should bare in mind that e-readiness is part of a complex and general economic structure, and its success depends on that structure.

2.12   Existing E-Readiness Frameworks

This Section gives more details on previous circumstances of e-readiness development tools /models . Several organizations, academia and researchers have suggested different tools considering the importance of the e-readiness assessment. Arce and Hopmann,(2002) confirms that different organizations attract emergence of concept of e-readiness, by developing various e-readiness assessment tools , showing the level of preparedness and capabilities organizations have as far as e-readiness is concerned .

2.12.1 Capability Maturity Model

The Capability Maturity Model (CMM) is a popular measure of the maturity of the software development process Pöppelbuß & Röglinger, (2011). CMM consists of five levels that start from initially chaotic process to a more valid and constant process execution of projects. This is illustrated in Figure 2.13.1-1
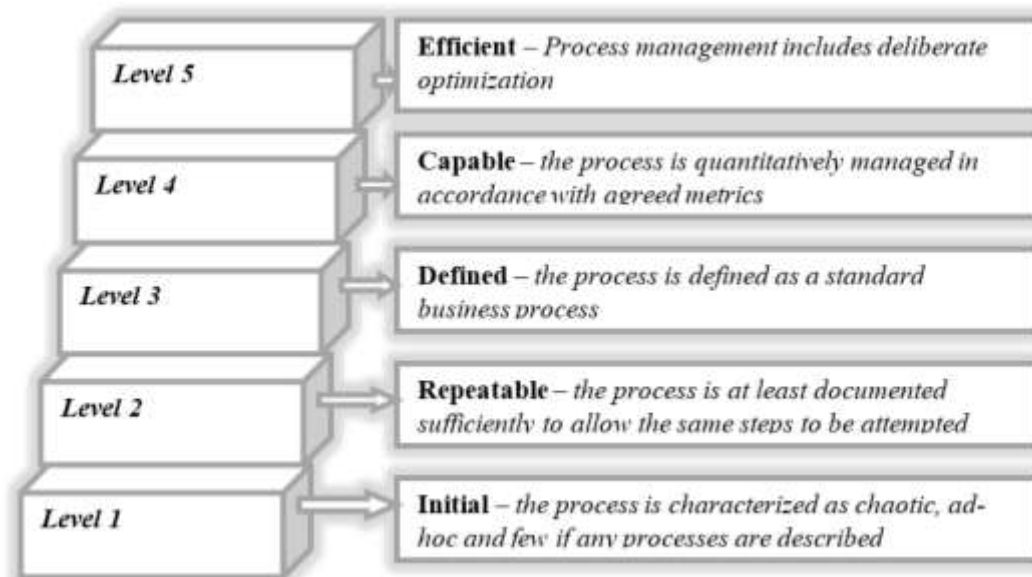
Figure 2.12.1-1-Capability Maturity Model by Pöppelbuß & Röglinger, (2011)

The levels look at the process of software development with a view of improving product quality, cycle time and productivity of employees Jiang et al., (2004). CMM focus on controls needed to manage activities and actors in teams for software projects. Tasks are assigned and appropriately performed according to the set guidelines. Some studies show that there is positively correlation between organizational performance and adherence to maturity model processes (Herbsleb et al., 1997).

2.12.2   Construction Engineering Readiness Assessment Model

On the other hand, Construction Engineering Readiness Assessment Model (CERAM), just like CMM, assesses the maturity process of projects in two main domains. One domain considers process elements

while the other deals mainly with technology elements. As can be seen from figure 2.13.2-1, the process elements consist of eight attributes in upper part of a concentric circle
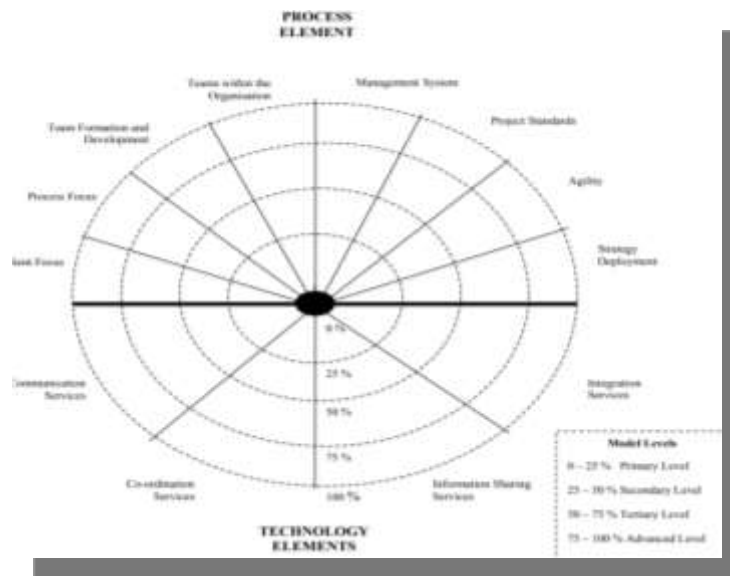
Figure 2.12.2-1: Construction Engineering Readiness Model by Khalfan, (2000)

The elements are; client focus; process focus; team formation and development; teams within the organization; management systems; project standards; agility and strategy deployment. While the segment of concentric circles analyzes attributes of technology elements; integration service; information sharing services; coordination services and communication services.

All the elements are assessed at four levels of maturity. The most basic level of maturity is the primary. At this level, the organization has no idea about Construction Engineering (CE) processes. This accordingly is informed by chaotic deployment of technology at this level. Whereas at the advanced level is an organization has achieved highest order of maturity. At this level, her processes are optimized efficiently, and organizations benefit fully in the spheres of; strategy dissemination, customer focus and project standards.

This model looks at maturity levels of an organization in software project management in linear manner, where an organization incrementally matures starting from the initial primary level from 0% to 25% ; while secondary level is from 25% to 50% ; the tertiary level from50% to 75%; and finally advanced level at 75% to 100%.

2.12.3 Benchmarking and
Readiness Assessment for Concurrent Engineering Construction

Another model, reviewed, that looks at maturity of an organization in respect to the quality of project development process is the Benchmarking and Readiness Assessment for Concurrent Engineering Construction (BEACON) by Malik Mansoor ali khalfan, (2001) was introduced by Centre for Innovative Construction Engineering (CICE) and SERVQ of Loughborough University in 2002 as an improvement to CERAM.

As opposed to CERAM, BEACON evaluates maturity levels of project development process in five stages of; ad-hoc; repeatable; characterized; managed and finally optimized.
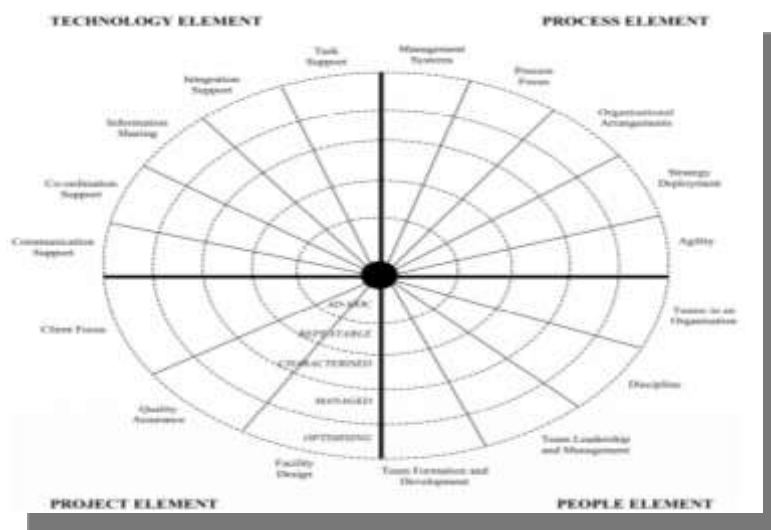
Figure 2.12.3-1; BEACON by Malik Mansoor Ali Khalfan(2001)

BEACON compares elements of maturity in four segments; process; people; project and finally technology, whereas CERAM considers   processes and technology elements only. BEACON considers additional elements for project development. These are; facility design; quality assurance; organizational arrangement; team leadership; discipline and task support

It however does not quantify the steps of maturity as percentages making it difficult to have clear boundaries between the respective maturity levels.

2.12.4 Technology Readiness Model

Another model that graduates technology maturity levels is the Technology Readiness Model (TRM). It proposes a systematic approach to measure the level of technology readiness of an enterprises in three dimensions; strategic, tactical and operational (Oztemel, E &Korkusuz,T., 2006). As seen from figure 2.13.4-1, these levels are graduated from 0 to 100, where 0 is the lowest level and 100 the highest, along the vertices of a triangle.
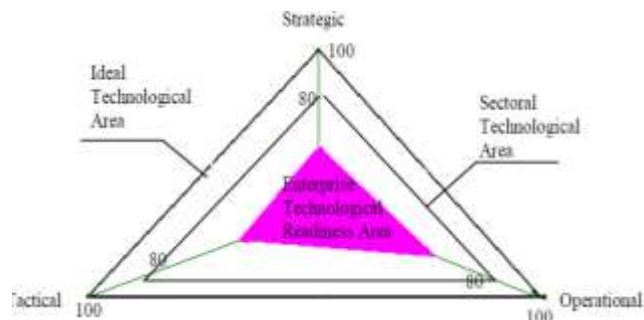
Figure 2.12.4-1: Technology assessment model by Oztemel, E &Korkusuz,T., (2006)

As a result of reviewing CERAM and BEACON, TRM was developed as a unified model to create a systematic approach of measuring technology readiness in an enterprise along these three levels; strategic, tactical and operational.

The important aspect of this model is that it recognizes the organizational base line at each level, against which elements are weighted on scale aligned with an overall industry readiness and ideal technology readiness in the areas of technology Knowledge and Information Management, infrastructure, baseline strategy and management baseline.

Measuring technology readiness in a networked world, numerous factors are involve; availability, speed, and quality of network access, use of ICTs in schools, workplace use, government policies and communities of practice among others (Bridges, 2001, 2005; CID, 2000).

2.12.5 Kenya Network Assessment Framework

In order to expound on CID assessment tool which is an example of e-society tool that offers a broad source of staging dissimilar indicators, Kenya Network Assessment Frame work (KENET) was developed by modifying CID tool and specifies it by presenting new types of indicators and sub-indicators suitable to suit higher learning education organizations. The new sub-indicators are suitable in inferring the data staging individually of the 17 readiness indicators.

 According to Kashonda & Waema, (2014), KENET assesses the level of readiness on the usage of ICT in the Kenyan universities, where, survey was carried out in 30 universities. The study focused assessing level of readiness of Higher Education (HE) institutions in Kenya to use ICT in teaching, learning, research, and management. Indirectly, it also assessed the capacity or readiness of these institutions to use e learning for upgrading of worth education and eventually increase access to higher education in the country. Additionally the study indicates that effective use of ICT in higher education institutions would also ensure that the Kenyan tertiary level workforce effectively participates in the emerging global knowledge economy. However, KENET framework just like CID, readiness assessment is diagnostic and has stages each of the indicators on a scale of 1 to 4, where one represents

unprepared and four the highest degree of readiness. Using a diagnostic e-readiness framework makes it easy for the results to be used. The framework contained 17 indicators but grouped in five categories;

Network access, networked campus, networked learning networked society and institutional ICT strategy.

2.12.6 Assessment Model for E-Government Readiness

Based on CID and KENET background E-Government Readiness assessment model by Ahmed Al-Omari and Hussein Al-Omari, (2006) presents a general framework model that assesses the necessary key factors to implement in any E-government initiative worldwide. These factors represent the basic components to be assessed, before launching of "e-initiative" for assurance that, right implementation is done, and in the right direction. A further study on e-Government Readiness by Dzhusupova, Z., Shareef, M., Ojo, A., and Janowski, T.(2010) indicates that   E-Government planning involves assessing the electronic Government preparedness from different ways, elaborating a long-term vision, formulating strategic goals and objectives, aligning them with national development strategies,public administration reforms, and defining priorities and concrete implementation programs. The following assessment model for e-Government Readiness Assessment has been designed by applying the component based framework with some assessment components partly obtained from the UN e-Government Readiness Assessment Survey, brown University Global e-Government Survey, and Accenture e-Government Leadership Survey.

In addition, the study argued that Organizational readiness, inflexible nature of E-Governments, business process and long procedure delay need process reengineering since it affects the service delivery of the government objectives. Further, the study indicates that organizations structure be assessed for Readiness, Governance and leadership Readiness, Customer Readiness, Competency Readiness, Technology Readiness and Legal Readiness.

The model has six attributes as shown:

Figure 2.12.6-1 E- Government E-Readiness Assessment Model Hussein Al-Omari (2006)

a) Competency readiness: This means organizations require to bring on board those people who have technical skills

b) Technology readiness: This involves technologies that would enable digital transformation.ie hardware, software, networks infrastructure, Internet penetration, software application.

c) Legal readiness; these are laws and bylaws, that gives direction on issues that concern government service delivery.

d) Organizational readiness, this involves inflexible environment of E-Governments, in business processes, delays in service delivery and requirement for reengineering.

e) Leadership and governance readiness assessment: Governance is one of the central driving forces of every project initiative. Leadership that is gifted to realize the actual expenses and paybacks of the project.

f) Customer readiness: This main concerns is in regards to customer readiness dealing with accessibility issues.

2.13 E-Readiness and Digitization

E-readiness of a country refers to the capability of a government to use ICT for sustainable wellbeing and development. E-readiness assesses the magnitude and quality of ICT infrastructure, relevant skills, and rules and guidelines. E-readiness has become an important tool for countries, governments, citizens, and organizations as the world turns into an open global market. It also supports worldwide

socio-economic expansion by changing the traditional methods of conveying information into more efficient contemporary methods. The commercial structure of the current world is reliant on the technical aspect of the country and, therefore, governments and institutions continuously invest in innovative ways, to adjust or maintain the swiftness with even better technologies.

Digitization readiness assessment is done to ascertain the preparedness of KNEC to carry out conversion of hardcopy documents to digital records. The e-readiness assessment helps to ascertain the true picture of preparedness, it shows specific state of readiness, which reduces budget over runs and financial plan, that reduces digitization project delays, improve communication to the clients and continuously invest in innovative ways.

 The tactical decision-makings, strategic directions, programs and resource allocations are the outcomes of an assessment of an enterprise. The factors that came out strongly from the literature review are;

- Leadership and governance: by (Ahmed Al-Omari and Hussein Al-Omari ,2006;)
- Technology readiness by (Oztemel, E & Korkusuz,T., (2006); KENET framework developed by (Kashonda and Waema, 2011).)
- Organization readiness(e-Government Readiness by (Ahmed Al-Omari and Hussein Al-Omari ,2006)
- Competency readiness by (Ahmed Al-Omari and Hussein Al-Omari ,2006)
- ICT security by (Ahmed Al-Omari and Hussein Al-Omari ,2006)

2.14   Analysis of E- Readiness assessment frameworks

A summary is developed for the frameworks reviewed. CMM, CERAM, BEACON, TRM, KENET and e- government e-readiness assessment model. Technology readiness Model (TRM) (Oztemel, E & Korkusuz,T,2006); Kenya Education Network (Kashorda, M., & Waema, T.2014); Derived E-Readiness Framework for E-Commerce (Abdul Hakeem Idris,2015); E- Government E-Readiness Assessment Model Ahmed Al-Omari and Hussein Al-Omari(2006)

Table 2.14-1 ; Analysis of E- Readiness assessment frameworks

Framework	Author	Description	Research Gap	Focus of the current study
Technology readiness Model(TRM)	Oztemel, E & Korkusuz,T., (2006).	TRM was proposed for assessing technology readiness in a general enterprise. The factors applied produced good results The study focused on strategic, tactical and operational levels dimensions. The elements which were weighted were; knowledge and information, infrastructure, strategies and management.	The study did not validate factors and the weighted values in real company. Therefore, although the results of the proof of concept were encouraging, weights values used were not conclusive since the factors were not validated in a real company environment.	In the current study KNEC, being an enterprise considers Technology readiness as a factor, Which will be integrated with other factors to generate a single model that best suites assessing organization digitization readiness in a real organization.
Capability Maturity Model (CMM)	Pöppelbuß & Röglinger, (2011)	CMM focus on controls needed to manage activities and actors in teams for software projects.	The scope of CMM is very broad which tries to explain problems of the whole world.	Current study sought to reduce the scope to digitization readiness in a

Framework	Author	Description	Research Gap	Focus of the current study
				public organization.
Construction Engineering Readiness Assessment Model (CERAM)	Malik M.A. Khalfan (2011)	The model assesses the maturity process of projects in two main domains. One domain considers process elements while the other deals mainly with technology elements. This model looks at maturity levels of an organization in software project management in linear manner. Where an organization incrementally matures starting from the initial primary level from 0 to 100%	The study assesses e-readiness in only 2 elements that are process and technology element without considering other like people competencies that are very crucial in my study. Therefore, there is no evidence that it can work in digitization of examination records.	The study considers technology and process elements that are found crucial and combine with other reviewed models to generate a single model that best suites assessing organization digitization readiness.
.Kenya Education Network	Kashorda, M., & Waema, T. (2014)	KENET framework assesses the level of preparedness on usage of ICT in the Kenyan universities. Also focused on network connectivity for research and education	The limitations of this model is that it only checks preparedness of Kenya networks in high learning institutions for research and	Current study sought to consider Network access and institution ICT policy and strategy

Framework	Author	Description	Research Gap	Focus of the current study
		learning. The model looked at Networked access, campus, learning, society and Institutional ICT strategy	learning, it does not consider other factors technology readiness which has been rated high in e-readiness models.	factor s these 2 factors will be integrated with other factors from other e-readiness models to develop a single model which will best suite assessing digitization readiness of examination records
Benchmarking and Readiness Assessment for Concurrent Engineering Construction(BEACON)	Malik Mansoor Ali Khalfan(2001))	This model Contextualized the factors and indicators in an organization that looks at maturity of an organization in respect to the quality of project development process. The factors considered were technology, people, project and process element.	The author of this model limited his theoretical analysis to four existing frameworks/models. The staging of these models are not quantified as percentages or level making it difficult to have clear boundaries between	Current study sought consider technology, people element, and integrate with other e-readiness models to develop a single model that best

Framework	Author	Description	Research Gap	Focus of the current study
			the respective maturity levels.	suites assessing digitization readiness of examination records. The staging of the proposed framework is done in level 1-4 that will show clearly the readiness of the factors.
E- Government E-Readiness Assessment Model	Ahmed Al-Omari and Hussein Al-Omari(2006)	This model Presents a general framework model for E-Government Readiness Assessment before starting an initiative, it is better to have a guarantee that you invest in the right direction. The six key factors for E-government initiative are; Organizational Readiness, Governance, Customer	The limitation of this E-Government readiness assessment model presented in this study can only help as a general guideline that makes it a very difficult job where each government has its own objectives and priorities. Therefore, it is not clear whether it can	Current study sought to pick some factors which are considered relevant i.e. technology readiness, organizational readiness, competency readiness ,leadership and governance and integrate

Framework	Author	Description	Research Gap	Focus of the current study
		Competency, Technology and Legal Readiness.	work in an examination set up.	with other e-readiness models to develop a single model which will best suite assessing digitization readiness of examination records

2.15   Adaption of the E-Government Tool

The proposition of KNEC digitization e-readiness framework follows the E-government readiness tool. As seen earlier, the E-government readiness assessment tool has been tested and validated as a vital strategy tool for numerous countries, mainly from the context of building trust of the citizens to apply principles of good governance and improve services through automating government functions. Among the sectors that governments focus for automation are; lands, judiciary, health, education, electoral processes and revenue collection (Hassan & Fatimah, 2014).

The E-government assessment tool specifies 6 factors and 23 indicators. This study tries to align these factors and indicators to the proposed KNEC digitization framework. While all these factors could be important to this study, an exception of two factors is vital within the limited period to undertake enquiry was not adequate, and on the other hand, a study by Hussein Al-Omari, (2006) advised that, a separate legal assessment is required if an organization wishes to implement e-initiative. Main concerns regarding customer readiness, this study would require interacting with a big number of KNEC Customers. Given, that KNEC has many stakeholders who include, more than twenty million people that sat previous exams, examiners, schools, colleges, ministry of education and KICD among others. The study under the current financial and time constraints would not be able to seek views from these stakeholders. Consequently, the study decided to reduce the scope by exempting legal and customer readiness. Factors under consideration, for this study, therefore are organizational readiness,

technology readiness, competency readiness and leadership and governance readiness. In the context of examination management, ICT security is critical and the readiness measurement for the same may be required. This has been collaborated by studies Sun.et al, (2015), where critical data that support mission critical operation, is often the target cyber-attacks since when compromised the impact on service delivery is high. Its protection is seen as critical to increasing user confidence in automated systems Stine et al., (2008).

From the model adapted, resulting set of 5 factors and 15 relevant sub factors are grouped as follows;

1. **Technology readiness**
    - Software Application
    - Hardware
    - ICT infrastructure

2. **Competency readiness**
    - ICT set skills
    - Learnability
    - Agility

3. **ICT security**
    - Data security plan/policy
    - Access control
    - Security Trust
    - System Backups

4. **IT Governance readiness**
    - ICT Policy and strategy
    - Team dynamics management
    - Culture change management

5. **Organizational readiness**
    - Resource allocation (human, financial, tools)
    - Top management support

2.16   Proposed Digitization E-readiness Assessment Model

Digitization Readiness Assessment Model (DRAM) proposes that improving organizational readiness, IT governance; Technology readiness; competence readiness's and ICT security would greatly enhance the organizational ability to undertake digitization projects. According to this proposed framework, these factors were assessed in staged fashion that ranged from one to four.   This kind of

assessment takes into consideration dynamism of an organization in all the five different aspects. For example, once an organization discovers that it has achieved highest maturity in organizational readiness then it should focus in other areas where it has a lower index. Accordingly, the indicators are assessed and grouped on a scale of 1 to 4, where 1 represents lowest readiness level while 4 represents the highest or mastery level of readiness an organization. They then will aggregate in an overall digitization readiness index as shown in figure 2.17-1. Each of these indicators is discussed to reflect -how an organization can measure progress made in particular factor.

Figure 2.16-1: Proposed Digitization E-readiness Assessment Model
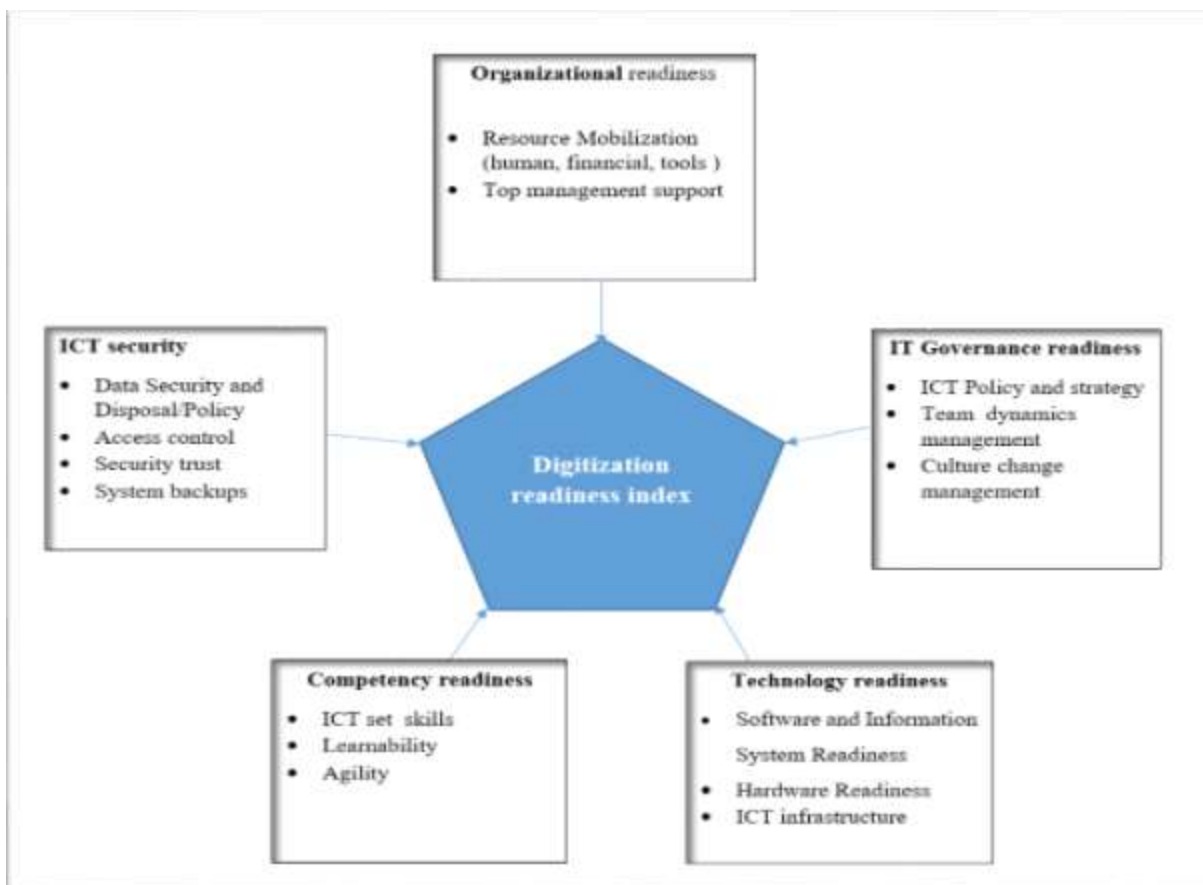
2.16.1 ICT Governance Readiness

ICT leadership and governance according to John M. Bryson, (2018) looks at governance and people leadership aspects that help achieve successful outcome in projects. According to the Information Communication Technology Authority (ICTA), which regulates ICT in Kenya. It emphasizes on governance indicators as adherence to digitization standard procedures through established policy, team dynamics management, and culture change management.

ICT Policy and Strategy indicator

A study by Siong Choy Chong (2006) indicates that Institutional ICT Policy and Strategy supports human values for employees to contribute optimally to project deployment. The policies consist Standards that establish requisite steps for content development (Yakout et al, 2006). In the context of KNEC, requisite image clarity attributes, such as what should be value of pixels, how should the focus of image be, and what will be the minimal sizes and how should indexing of images be done should be standardized . Further, the standards define a trusted digital repository that ensures high-level preservation of images.

Accordingly, the three areas of focus are; ICT policy existence, awareness and usage. The policy should establish the requisite standards necessarily for project implementation.

Team Coordination and Management

Team dynamics management is the second indicator reviewed. According to DiTullio, L. A. (2009) correlates project success with teamwork. Accordingly, technology allows managers facilitate better communication to team members, reducing time and expenses associated with group work. The study measures ease of communication between teams such embracing social media tools, time efficiency and group work related costs.

Culture Change management

A saying by Peter Drucker "culture eats strategy for breakfast," contains a lot of truth. In real sense, organizations requires time to build and change. This is why companies struggle in their respective market space when disrupted. On the other hand, McKinsey, (2014) indicates that companies can rapidly adapt to technological change on labor markets in the world of digitization and automation. Digitization disrupts the way business is conducted. Therefore, in this study culture change will be measured on the dimension of how staffs adopts change by measuring the attributes of positive or negative attitude towards digitization, at personal level and corporate level.

2.16.2 Technology readiness

Adjorlolo and Ellingsen, (2013), indicates that technology readiness is assessed by checking the availability of hardware; network, related software and IT support personnel. Additionally Afari-kumah, (2014), indicates that presence of these elements are critical.

In this study technology, readiness is evaluated by checking internal capacity of KNEC to carry out digitization project, for proper decision-making. Preparedness is assessed on hardware readiness, software readiness, storage capacity and ICT infrastructure. Willingness of management to acquire the required facilities is also assessed.

Hardware readiness indicator

This indicator measures abilities to generate hardware specifications from requirements to handle digitization, acquire hardware as specified and support. On the other hand, assessment is done on the availability of computers scanners and printers with capacity to support digitization.

Software readiness Indicator

Software readiness is assessed in terms of availability of software applications that can support digitization in KNEC, and general system support procedure, which allows for orderly and sequenced guidance of the inquiry process. Secondly, the software application is tested on existence of system documentation for ICT projects. Availability of software documentation helps in keeping track of all aspects of an application for maintenance and knowledge transfer to other developers/users. The third measure will be availability of staffs with skills needed to use and support software. Forth willingness of management to acquire the required software to support digitization incase the current applications cannot support digitization.

ICT Infrastructure Indicator

In this study, ICT infrastructure is evaluated through accessibility, use of networks and willingness of management to Invest on bandwidth required during digitization implementation. Under Internet usage, evaluation is done to check the Percentage of individuals using the internet by checking staff satisfaction level of the internet speed. The staging will be determined on how reliable the infrastructure is.

2.16.3 Competency readiness

The existence of qualified personnel in the public sector is important as it shows Competencies on how people work within digital environments, Attitudes and abilities to embrace technology collaborate with others and work effectively in the digital world. The model comprises competencies, by looking at two aspects: personality and ability. The indicators identified were; ICT set skills (certification on ICT courses and ability to work with computers and scanners), Learnability (the desire to develop and improve), Agility (the capability to adapt quickly and effectively). If employees achieve low score on these core competencies, they are likely to be uncomfortable in a digital workplace.

ICT Set Skills Indicator

ICT set skills were assessed on the current situation in KNEC by conducting a cross-functional skill gap analysis to identify relevant technical skills the ICT personnel hold. Apart from being computer literate and ability to use computers, scanners and printers. More skills are required to undertake

digitization project. Problem formulation skills, ICT project management skills, Systems implementation, and supervisory skills and systems specification skills. The higher-level skills by ICT department personnel will be required to specify, design, prepare request for proposal (RFP) documents, evaluate bids, negotiate and sign contracts and supervise and manage digitization project.

Learnability indicator

Learnability is an urge for seeking self-improvement. This indicator will be measured by checking on percentage of the staffs who have the desire to develop and improve themselves by requesting for a training or those who have undergone for any training in the last two years.

Agility

According to Bersin & Associates (2013), agility is capability, which describes a person's speed to learn willingness to learn from experience, and ability to apply that learning under new situations. A study by Daniel Newma, (2017) indicates that Agility is the Key to Accelerate Digital Transformation. He further said in order to survive in a technological hairpin turn, you have to be agile. From the study, 68% of companies identified agility to be one of their most important initiatives. For this study, it is expected that after digitization, processes will change .Agility is measured by checking the capability to adapt quickly and effectively by assessing staff awareness of organizational goals, ability to learn, willingness to change.

2.16.4 Organizational Readiness

Organization readiness is considered as a means to measure the preparedness to accurately link organizational IT efforts and expected outcomes. E-readiness has been identified as critical to the development and upgrade of digital systems within an organization, that is to say, e-readiness assesses organizational relative advancement towards achieving critical investment in ICT to meet business objectives (Hartman et al , 2001); (Molla and Licker (2005). In this study, Organizational readiness in KNEC will be evaluated in two main points, resource mobilization and Top management support.

Project Resource Mobilization

Project management guidelines helps institutions organize, plan and control digitization projects. This cannot be done without mobilizing resources that maximizes the potential for projects to succeed. project managers also needs to prioritize different activities involved and assign resources. Kenney & Rieger, (2000) indicates that Time limits should be assigned for completion of each task. Stephene (2013) indicates that use of modern technology in business helped in efficient delivery of

projects that meet customer satisfaction after .carrying out a study on importance of technical resources in the performance Projects.

Measuring this indicator is done by identifying the willingness of organization to provide resources required for digitization (human, financial and tools) project by looking at organizational preparation for resource mobilization.

Top management support.

Setting goals and objectives for organizations projects is the responsibility of Top management, by guiding those goals to achieve success. A study by Davenport, (2000) indicates that, high-level executives should have a strong commitment for organization to achieve a successful project implementation. They should commit time and money for Resource allocation (human, financial, tools).on the other hand, in this study, top management support will be measured by identifying the importance level given by the management, provision of Policy on project planning and implementation and project management guidelines for digitization project.

2.16.5 ICT Security

The international standard ISO/IEC 13335-1 (2004), describes ICT security as aspects relating to defining, achieving and maintaining the confidentiality, integrity, availability. Jungwoo Ryoo et al,(2009) indicates that when computers are connected in a network there has to be proper security measures, as this potentially increases accessibility to intrusion via the Internet. KNEC being an organization that deals with critical data and shares the same online is prone to security threats. This study evaluates the progressive security that ought to be undertaken to protect and preserve digital data. The study evaluates, data security policy, access control, system backups and security trust.

Data security and Disposal Policy

Ochieng' C. Oguk, (2016) indicates that, data security and disposal policy are rules that guide the behavior of users and IT personnel on the classification and safe handling of information system, and the consequences of violating the IT security policy. On the other hand disposal policy ensures secure disposal/destruction of data held on tapes, CD and diskettes, Indicating what methods is used to of permanently erase data or Physical destroy the media e.g. shredding, incineration.

According to Information Systems Audit and Control Association (ISACA,2008), the overall objective of an information security program is to protect the integrity, confidentiality, and availability of that information (CIA triad).Data security provides ways in which, business data and related information

is protected and preserved. About this study data security, is evaluated on the existence of the data security/disposal policy staff awareness and compliance to the same.

Access control

This security technique regulates access of resources in a computing environment. It is an important concept to minimize risk in business or organization. To use access control systems, user credentials must be validated before being granted access. In physical control systems, these credentials may come in many forms, but credentials that are not transferable, provide the most security for example use of biometrics. In this study, access control is assessed by evaluating physical and computer access.

Security trust

A study by Gholami and Laure, (2016) indicates that many organizations use Cloud computing as an efficient solutions to store and analyze huge amount of information .This paradigm shift raises a broad range of security and privacy issues that are taken into consideration for example loss of control, and trust are key challenges in cloud computing environments. On the other hand, an article By Paul Heney, (2018) indicates that Siemen's company had a press event on cybersecurity in Munich, where the company focuses on the issue of trust. The press concludes that without trust in digitalization, industrial users will not embrace the IoT and connected technologies. She also added that if people and organizations cannot trust digital technologies, they do not accept or embrace the coming digital transformation. This study measures security trust by evaluating the confidence level of staffs in security in systems and controls (i.e. authentication and authorization controls) put in place and confidence of the system controllers.

System backups

In order to protect organizations from data loss, Backup and recovery process is important. This is sometimes referred to as operational recovery. This involves restoring data to its original location, or to an alternate location where it can be retrieved used in case data is lost or damaged.

This study refers to the CMM model and proposes that system backup indicator should measure the degree to which an organization is prepared to rely on backup; frequency of backups, verification, location of stored data and storage capacity.

2.16.6 Digitization Index

Digitization readiness index is determined from preparedness level of KNEC to implement digitization. A weighted mean is computed from expected level of readiness from existing factors;

technology readiness, competency readiness, organization readiness, ICT security readiness and ICT Governance readiness.

Staging of factors to get the final digitization index is done. Mean and standard deviation is computed to determine the trends in the responses and in comparison to the generic scale below as adopted from (Ouma et al, 2013).

In this study, staging factor is done using a four level scale. Therefore, adapting the oumas et al, (2013 scale for staging will be more accurate for digitization readiness index. A status column has been added to give it more meaning and to enrich the digitization readiness index.

Table 2.16.6-1 Digitization readiness index Scale

Levels	Mean	status	Scale
Level 1	1-2	Un aware	not ready,and needs a lot of work
Level 2	2-2.5	Adhoc	not ready and needs some work
Level 3	2.5-3	Institutionalized	Ready but needs a few improvements
Level 4	3-4	Guide	Ready to go

Figure 2.16.6-1: Readiness scale based on Ouma et al. (2013)
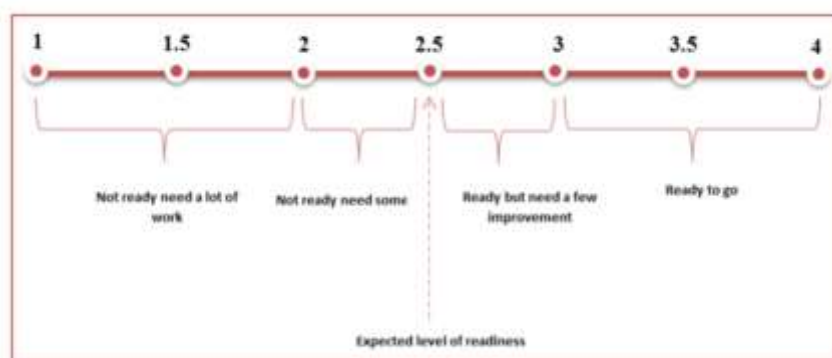
Table 2.16.6-2: Operationalization of DEAM model

Factors	Indicators	Sub indicators	purpose
(Independent variable) ICT governance readiness	ICT Policy and Strategy Indicator	• Existence of the policy documents • % of Staff awareness of the policy • % of staffs Using of the policy	Extent to which existence awareness and usage of the of policy document influence digitization readiness. In addition, the level at which KNEC is as far as digitization project is concerned.
	Team dynamics Management	• % of staffs who embrace teamwork through employees attendance during group activity • Percentage of staff embracing social media tools to communicate work related issues. • Effectiveness in project teams (capacity to accomplish goals).lateness during group activity	Extent to which team work and Team effectiveness may affect digitization readiness .it also measures the level at which KNEC is as far as team dynamics is concerned
	Culture Change management	• Percentage of staff who are willing to change the way they do their day today work if digitization is done. • Percentage of staff who would be willing to participate in digitization project. • Existence of Capacity building mechanisms.	Extent to which Existence of Capacity building mechanisms involvement of staffs in projects and willingness to adopt change will influence the level of digitization preparedness.
	Software readiness	• Existence of system requirement specifications (SRS) documentation for existing software. • Availability of software applications, which can support digitization.	Extent to which Existence of SRS) documentation availability of software to support digitization, presence of skilled software users/supporters and willingness of management to acquire the required software to support digitization would

Factors	Indicators	Sub indicators	purpose
(Independent variable) Technology readiness		• Percentage of ICT staffs with skills needed to support software. • Percentage Staffs with skills needed to use software. • Willingness of management to acquire the required software to support digitization.	influence the digitization readiness.
	Hardware readiness	• The availability of hardware such as computers, printer's scanners devices. Which may support digitization • Percentage of staff with skills to generate hardware specifications to support digitization. • Willingness of Management to acquire the Hardware required for digitization • Percentage of ICT staffs with skills needed to support Hardware for digitization.	• Extent to which basics of staff access to computer, skills to generate hardware specifications skills to support and Willingness of Management to acquire the Hardware required for digitization may influence digitization readiness.
	ICT infrastructure	• % of staffs use internet for KNEC related work • Percentage of staffs who are Satisfied with Speed of Internet. • Percentage of staffs who use internet for their personal work. • Willingness of management to Investment on bandwidth required during digitization implementation	• Measures readiness and usage of ICTs at work ,internet satisfaction and willingness (e-mail, ERPs, e-learning platform, Productivity tools) management to Investment on bandwidth required

Factors	Indicators	Sub indicators	purpose
(Independent variable) competency readiness	ICT set skills	• Course pursued • Highest level of education • Number of trainings attended • Number of years worked	The indicator measures the degree to which KNEC has competent and well trained in ICT professional and support staff that can support digitization project.
	learnability	• Percentage of staffs who desire to develop and improve themselves through training. • Percentage of staffs who learn ICT on their own. • Percentage of staffs who are interested in learning new technologies.	• The indicator measures the extent to which staffs motivation to learn may influence Digitization readiness.
	Agility	• % of staffs who have ability to learn • % of staffs who are willing to change with digitization	• The indicator measures the degree to which KNEC staff are agile to changes and the degree to which this can influence digitization readiness.
Independent variable) Organizational Readiness	Resource mobilization	• Willingness of organization to identify potential donors to finance digitization • existence of resource mobilization plan • Identifying potential funding sources.	Extent to which financial, physical, human and technological resources affect digitization readiness
	Top management support.	• % of top management who consider digitization as the most important • % of management willing to offer leadership during digitization project	• The indicator measures the extent to which top management commitment will influence digitization readiness and the level at which the organization in terms of preparedness to

Factors	Indicators	Sub indicators	purpose
		• % of managers who may participate in monitoring and evaluation of digitization project • % of managers who gives digitization the highest priority	undertake digitization project.
(Dependent variable) ICT Security	Access control	• Existence of firewall. • Frequency of antivirus update • Administrative controls for audit trail. • % of staffs who are aware of existence of audit trial Adequacy of Physical Controls put in place to access data center.	Extent to which existence and usage of access controls would influence digitization readiness.
ICT Security readiness	Security Trust	• % of staffs who are confident about authentications of KNEC systems • Percentage of staffs who are confident about system user's authorization in KNEC. • Percentage of staffs who believe Digitized data will be more secure.	Extent to which perceived security trust influence digitization readiness.
	System back up	• Percentage Staffs who consider backups as the most importance. • % of staffs who Verify the data after back up Location of backup storage	Extent to which frequency of system backups, verification and off shore backup would influence digitization readiness. Also measure the importance backups have been given by the staffs

Factors	Indicators	Sub indicators	purpose
	Data security policy	• Existence of Data security plan/policy exist • % staffs who are aware about data security policy • % of staffs who comply with data security policy	Extent to which existence awareness and compliance of Data security policy influence digitization readiness

2.16.7 Ranking and Staging of Digitization Readiness Factors.

Factors Ranking carried out to identify from the Most critical factors to the lowest. The study evaluates and recommends that the highest ranked factors be considered as mandatory before the start of digitization project. Staging of the factors is done after the calculations of the final digitization index has been finalized to get the level at which KNEC is as far as digitization readiness is concerned.

LEVEL 4; (Guide) implies that a mean of above 3 should be at this level. Most critical aspects are in place and Management has optimized resources. ''ready to go''.

LEVEL 3 ;(Institutionalized) Implies that a mean of 2.5-3 the project is quantitatively managed in accordance with agreed metrics. Critical priorities are provided. 'Ready but needs a few improvements'

LEVEL 2 ;(Adhoc) implies that a mean of above 2.0 and below 2.5.the project has least of these requirements. Prioritization of resources is a problem. . 'Not Ready but needs some work. (there is room for improvement)

LEVEL1 ;(Unaware) implies that a mean of below 2.0, requirements not available at all. The organization has no capacity to do digitization. 'Therefore, not ready'.

3.0   RESEARCH METHODOLOGY

3.1   Introduction

Chapter three specifies the nature of the research design and the population studied. The chapter summaries the techniques used to conduct the study. It shows the methodology followed in the research Design, Population target, data sampling, data collection techniques and data analysis.

3.2   Research design

This is a framework of methods and techniques selected by a researcher to combine various components of research in a reasonably logical manner so that the research problem is efficiently handled (Adit bhat, 2019). It provides insights on "how" to conduct research using a particular methodology. In this study, a Cross-sectional survey was conducted to collect views from staff drawn at three different levels; management, operational and support staffs that deals with ICT function at KNEC. The Cross-sectional survey research was descriptive which helped researcher collect information in a brief time span.

The study used quantitative and qualitative tools to obtain data through a questionnaire. The study explored relationships between variables based on responses. Variables of phenomena can be related based on respondent's views (Gall, Gall, & Borg, 2007).

This research was conducted to gather information about KNEC in terms of technology currently being used and ability to invest on required equipment for digitization readiness assessment, what the company aims to benefit from digitization, and more importantly, determine the current preparedness of KNEC. The theme of the questionnaire was raised from the literature, in order to ensure that appropriate questions that conform to the factors and indicators found in the literature were asked.

Questionnaire Administration

A questionnaire was developed by using the factors and indicators identified in the framework. The questionnaire comprised of one part for each of the five framework factors. Each question was assessed against a 5 point Likert scale ranging from (1) strongly disagree to (5) strongly agree.

The choice of this research design was informed by the fact that it would allow the researcher to establish and explain the factors which influence success in digitization. The design was used to describe the characteristics and behavior of the target population. Descriptive research was designed to provide a picture of a situation as it naturally happens. This descriptive research aimed at getting the facts and good explanation of the success factors of digitization from the Management, operation officers, and support staff in KNEC. It also allowed the researcher to get the overall digitization readiness after computing and averaging all stages from the responses. In order to stage the indicator,

the researcher developed a staging framework that mapped the values of the indicator to a stage. Mean and standard deviation were computed to determine the trends in the responses in comparison to the generic scale below as adopted from (Ouma et al, 2013): Table 1:

Table 3.2-1; e-resdiness scale (Ouma et al, 2013):

Mean	Scale
1-2	not ready,
2-2.5	not ready but needs a lot of work
2.5-3	Ready but needs a few improvements
3-4	Ready to go

3.3   Population

The target and population of interest in this study was different levels of organization structure in KNEC. Management, operation officers and support staff officers who are involved with data retrieval and data processing. Management was sampled to give the direction and control of digitization project, while Operation officers are the ones who interact with data in day today bases and guide on challenges encountered and how effective digitization can be. Support staff always deals with customers in directing them to the relevant offices. Their input in the study was of high magnitude. ICT officers were involved in technical work in digitization, offering services and equipment's for the work. The study population was small therefore the sample population for this study targeted one hundred (100) respondents who interacts with Results data while doing their work at one point.

3.4   Sampling

The study chose a wide range of perspectives relating to digitization readiness in KNEC. The sample was purposive sampling technique since the target population of interest is significantly heterogeneous departments. Dudovskiy, (2018) indicates that, in order to get maximum variation sampling that relies on researcher's judgment, select participants with diverse characteristics. The sample was drawn from Management, operation officers, support staff who deals with ICT related function. Management was sampled in order to give the direction and control of digitization project. Operations officers manages a diverse workforce to ensure efficient day-to-day operations in digitization. Support staff assures that digitization operations run efficiently and help other staff members to adequately play their roles.

3.5   Sample size

In order to get the sample size, the researcher aimed at using purposive sampling and picked 20 respondents from each departments to have 100 respondents. This is a ratio of 1:4 to the whole

population of KNEC staff, which through researcher's judgment; the study selects participants with diverse characteristics. This was done to ensure the presence of maximum variability within the primary data, and to reduce bias. The researcher divided the whole sample size with the number of departments. KNEC has five departments. Therefore n=100 therefore 100/5=20

3.6   Data Collection

The research instrument used for gathering information from the respondent was a questionnaire, which was conducted to KNEC staff. The respondents were expected to answer mostly on experience perception, and the availability of the facilities they use for their day today work. For strategies, the data was obtained from the desk review of documents used for strategic planning, policies and procedure. Similarly, on this study participants were asked to indicate their opinion, Rank the factors that intends to capture additional views on the importance of the factors.

3.7   Data analysis

According to Kothari (2004), data analysis is an examination of what has been collected and making deductions and inferences from it. In this study, the complete questionnaires were checked for completeness and comprehensibility to ensure reliability. The data was summarized, coding done and keyed into the Statistical Package for Social Sciences (SPSS) for analysis. A two-stage study process was done where the analysis included grouping of the responses into various categories, and applied Principal Component Analysis (PCA). Descriptive statistics such as mode, frequency percentages were used to do data analysis.

When constructing a digitization index, the study carefully assessed the suitability of the data by studying the overall structure of the indicators and correlation between them. PCA was used to explore the underlying structure of the data and then construct KNEC composite index using the weights obtained from the indices. First, PCA was applied to the indicators belonging to each dimension in order to get the different dimensions components. Only the first component was retained in each iteration. By doing it in two stages, we ended up with a composite indicator that had desirable properties and helped the study rank factors according to their degree of digitization readiness index. The index was presented in stages from level 1 being not ready while level 4 being ready to go.

The digitization readiness index would assist KNEC in assessing the critical elements for effective digitization project implementation, and identify those areas that need strengthening or further development. The ability to identify areas to be addressed would strengthen the organization and in subsequent years, enable it to view improvement and note where progress is still needed.

3.8   **Pilot Study**

A pilot study was done where the researcher administered the questionnaire to five respondents who were randomly selected from a population of 100 project team members who understand ICT projects.

4.0   DATA ANALYSIS AND FINDINGS

4.1   Introduction

This study adapted an approach used by Ouma, G.O., Awuor, F.M., and Kyambo, B, (2013) in data analysis. The collected data was analyzed using factors analysis, frequencies, means, and standard deviations. To determine the digitization readiness index from the survey the data was tabulated according to factors and their indicators. The mean score of each indicator is computed by SPSS software based on responses and presented as tables, graphs and charts.

To determine the digitization readiness index for each factor, the means of the indicators were averaged. The average of means was converted to a scale of 1-4, in-line with existing practice: for instance, Ruikar et al. (2006) and Ouma et al (2013) measured e-readiness level on a scale of 1 to 4. In this research, a similar scale is used.

4.2   Demographic Information

Demographic data was mainly captured from section A of the questionnaire. The variables were aimed at providing insights on gender and demographical response.

4.3   Response Rate

One hundred questionnaires were issued as per the target sample size. Out of this, seventy-nine questionnaires were filled returned within the specified period of two weeks and analyzed. This comprised 79% response rate.

Drop and pick method was used to deliver and collect questionnaire's. The researcher also interacted face to face with respondents, which boosted and enriched understanding of the facts. The research also made follow-up through emails and phone calls that improved response rate.

4.4   Demographics Analysis

4.4.1   Response by Age

The study findings indicates that 16.5% of the respondents were aged between 20-29 years, 29.1% of the respondents were aged 30-39 years, 38.0% of the respondents were aged between 40-50 years, and 16.5% of the respondents were above 50years(see figure 4.4.1-1).This study findings show participation of different ages hence minimizing bias by age.
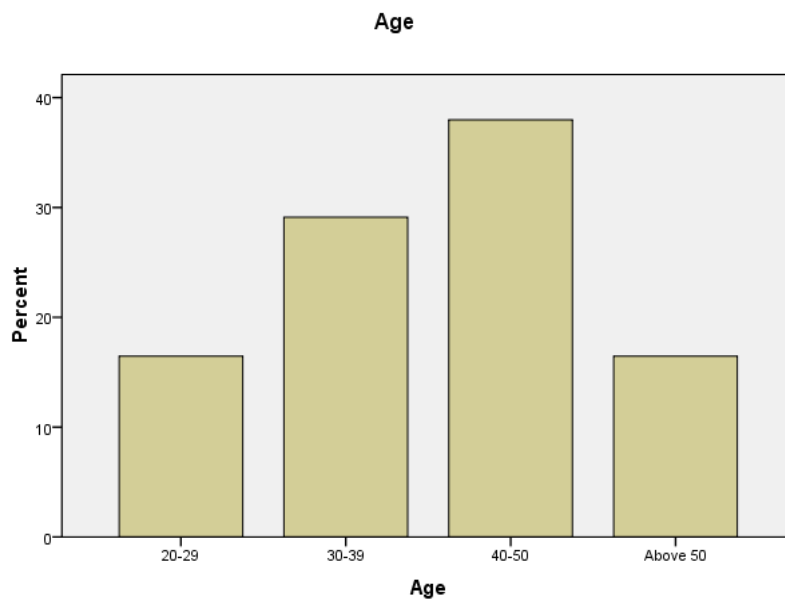
Age

4.4.2   Response by Gender

Majority of responded 69.6 % were male whereas females constituted 30.4% as seen from figure 4.4.2- This study is in consistent with previous studies (e.g., Teo and Lim (1998); Teo et al. (1999) that found a predominance of males respondents in Singapore. In fact, the percentage of female's respondents in this study is higher compared to Teo and Lim's study, where males comprised 89% of the sample. Therefore, this finding indicated that information collected was not biased based on gender.
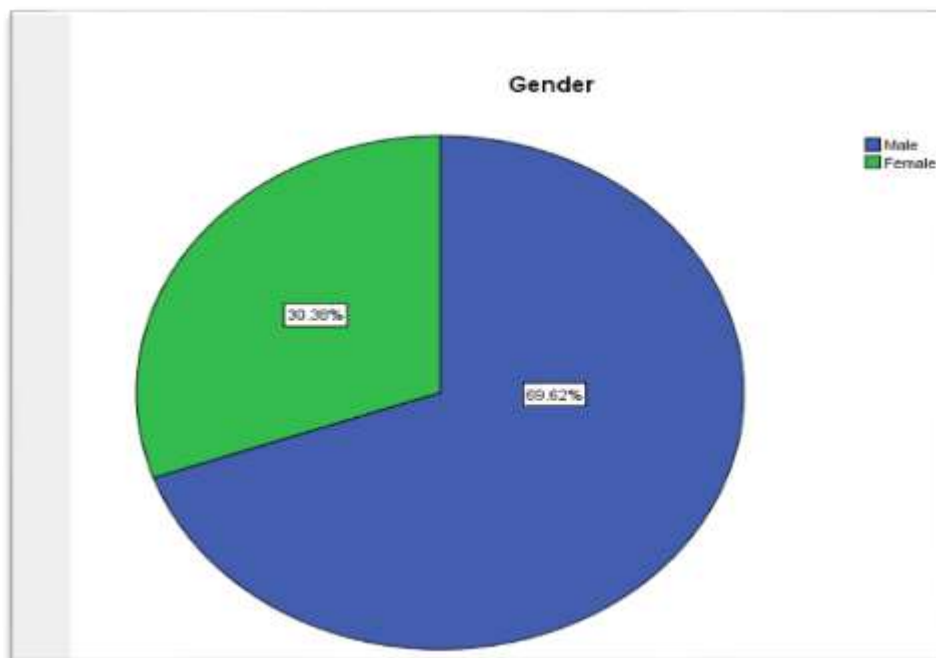
Figure 4.4.2-1 Response by Gender

55

4.4.3   Respondents by Department

Responses as per department are shown in the table 4.4.3-1, indicating that 32.9 % of responds were from EA, 21.5 % were from ICT, 19.0 % were from TD, 15.2 % were from CEOs office and 11.4 % were from CS department.   While these responses closely reflect proportional sizes of KNEC departments, TD department, which is second largest, had fewer responses than expected. This is due to departmental training that was ongoing at the time data collection occasioned this.

Table 4.4.3-1 Responses by departments

Department	Frequency	Percent	Valid Percent	Cumulative Percent
Exam Administration(EA)	26	32.9	32.9	32.9
Information Communication &Technology(ICT)	17	21.5	21.5	54.4
Test Development(TD)	15	19.0	19.0	73.4
CEO'S Office(CEO)	12	15.2	15.2	88.6
Cooperate Services(CS)	9	11.4	11.4	100.0
Total	79	100.0	100.0	

Response by Job Groups

Table 4.4.3-2, presents responses of the four different structural levels assessed: management, operational officer, assistants 'and support staffs.

Table 4.4.3-2: Response by Job group/EC Grade

	Job Groups/EC grade	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-4 (Supports Staff)	2	2.5	2.5	2.5
	5-8 (Assistants Staff)	31	39.2	39.2	41.8
	9-12(operations officers)	37	46.8	46.8	88.6
	13-16(Management)	9	11.4	11.4	100.0
	Total	79	100.0	100.0	

The study findings indicated that 11.4% of the respondents were management, 46.8% operations officers, 39.2% Assistant staffs and 2.5% supports staffs. This implies highest response was realized from operational officers and assistants, which is in line with the human resource representation in KNEC. This creates a normal distribution curve, which is healthy for any research.

4.4.4   Response by Work Experience

Figure 4.4.4-1 indicates that KNEC has an experienced work force. Staff with experience of over 6 years are over 65% of the respondents meaning they are well versed with KNEC processes, and can offer reliable opinion on digitization. This supports the earlier findings on demographics, which indicated that majority of staff, had worked over 5 years.

Figure 4.4.4-1: Response by Work Experience

4.4.5   Response by Level of Education

The study findings as shown in table 4.4.5-1 indicates that 30.4% of the respondents were diploma holders, 44.3% bachelor's Degree holders, while 25.3% of the respondents were Master's Degree holders. Respondents who participated in the study were adequately educated and provided informed responses.

Table 4.4.5-1: Level of Education

	Qualifications	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Diploma	24	30.4	30.4	30.4
	bachelor's Degree	35	44.3	44.3	74.7
	Master's Degree	20	25.3	25.3	100.0
	Total	79	100.0	100.0	

4.4.6   Computer skills

The study findings, as shown in figure 4.4.6-1, indicates that 96.2% of the respondents had ICT skills while 3.8% do not have. This implies that respondents selected to participate in the study were ICT literate and interacted with computers on daily bases. Therefore, their responses were well informed.
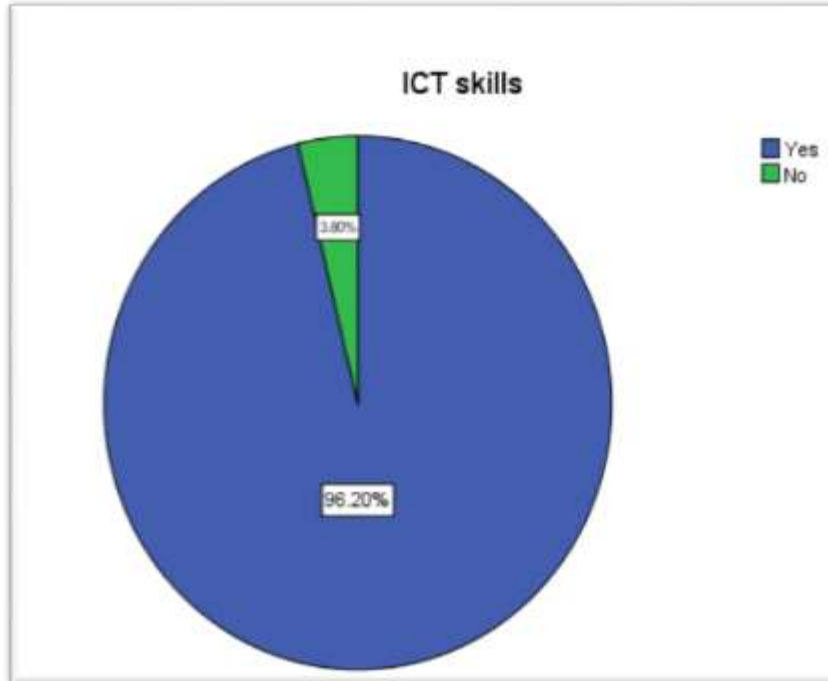
Figure 4.4.6-1: Computer skills

4.4.7   Computer Allocation

The study findings, as shown in figure 4.4.7-1, indicates that 93.67% of the respondents have been allocated computers while 6.33% do not have. This implies that respondents selected to participate in the study have good interaction with computers.
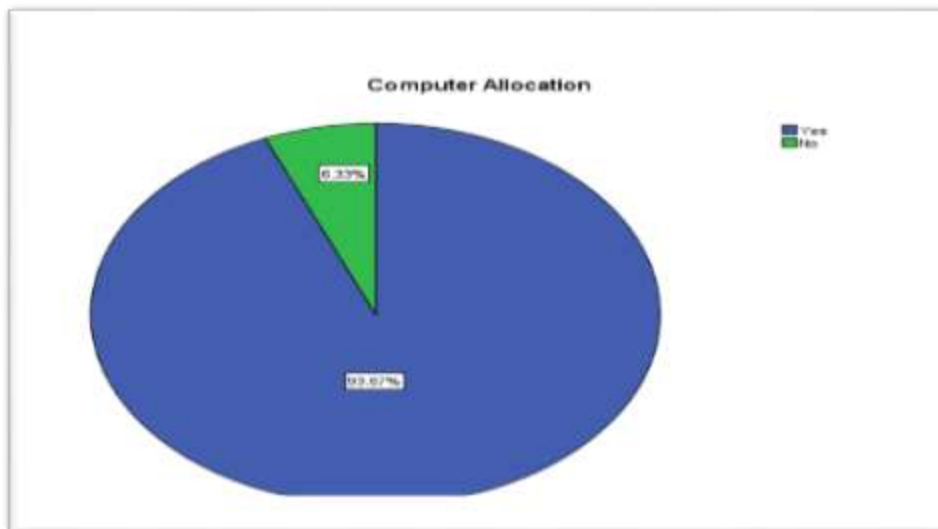
Figure 4.4.7-1: Computer Allocation

4.4.8   Usage of Computers

The study findings, as shown in table 4.4.8-1, indicates that accessing computer to check /Send Emails is rated 97.2% .serving clients is rated 78.6%.respondents who use computers to do core duties rates at 91.8 and those who use it to Access Social media are 77.6%. This implies that respondents selected to participate in the study interact with computers on daily bases.

Table 4.4.8-1: Usage of Computers

Computer usage		Every Day	Once A Week	Once A Month	Once A Year	Not At All	Mean
Checking email /sending emails	n	75	1	1	0	2	4.86
	%	94.9	1.3	1.3	0	2.5	97.2%
Serving clients (solving queries, confirming results, issuing certificates and slips)	n	55	1	3	0	19	3.93
	%	69.6	1.3	3.8	0	24.1	78.6%
Doing KNEC Core duties	n	70	1	0	1	7	4.59
	%	88.6	1.3	0	1.3	8.9	91.8%
Accessing social media (Facebook, Twitter, WhatsApp, YouTube)	n	42	17	2	2	15	3.88
	%	53.8	21.8	2.6	2.6	19.2	77.6%

Four question items were averaged to generate an overall mean for this factor. Like all factors seen earlier, they are computed by use of simple average of $<x> = \sum x/N$ to get the indicator mean.ie $\frac{4.86+3.93+4.59+3.88}{4} = 4.34$

Item means	4.86	3.93	4.59	3.88
Indicator mean				4.34
Percentage average				86.8

Since overall mean of 3.86 is computed from a scale of 1-5 the study converted the same to a scale of 1- 4 as used for staging. For this particular indicator for computer usage. Therefore, the readiness index is computed as $\frac{4.34}{5} \times 4 = 3.47$.   Computer usage index is 3.47

4.5   ICT Governance

Data on ICT governance provided insights on the extent to which awareness and usage of policy document influences digitization readiness. This section, therefore, presents the results pertaining to ICT Governance readiness in the form of descriptive statistics. The indicators associated to the output were; ICT policy implementation, team dynamics management and culture change management.

4.5.1   ICT Policy Implementation

The respondents were asked about their awareness of ICT policy where 82.3 % indicated Yes,16.5% indicated otherwise while 1.3% did not indicate any preference therefore the final valid percentages were,83.3% says yes while 16.7% said no. see Table 4.5.1-1

Table 4.5.1-1: Policy Awareness

Are you aware of KNEC ICT policy

Policy	Awareness	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	15	19.0	19.2	19.2
	yes	63	79.7	80.8	100.0
	Total	78	98.7	100.0	
Missing	System	1	1.3		
Total		79	100.0		

Total awareness response was 80.8% for those aware and 19.2% for those who are not. Presenting a ratio of 0.808 to 0.192 for those who are aware of policy to those who are not respectively. The mean stands at 1.8 at a scale of 2.to convert to a scale of four for readiness index will be **1.8/2*4=3.6**

Knowledge about ICT policy in KNEC

The respondents were asked to show how they gained knowledge of ICT policy. The findings are as shown in table 4.5.1-2
Most respondents learnt by reading hard copy 45.6 %, followed by those who read email correspondence 16.5% while those who learnt through training workshops were 13.9%.The respondents who learnt through downloading from website were 5.1% while those who learnt from a colleague were 5.1%. Most staff prefer reading hardcopy documents.

How did you learn about ICT policy

Knowledge	About Policy	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Through reading a hard copy	36	45.6	52.9	52.9
	By reading copy sent via email	13	16.5	19.1	72.1
	By downloading from KNEC website	4	5.1	5.9	77.9
	Through training workshop/briefing and sensitization organized by KNEC	11	13.9	16.2	94.1
	From a colleague	4	5.1	5.9	100.0
	Total	68	86.1	100.0	
Missing	System	11	13.9		
Total		79	100.0		

Use of policy documents

Table 4.5.1-3 shows the results of Respondents on how **often they refer to the policy**. Those who refer to it every week were 17.7 %, those who referred to it every month were 17.7%, every three months 17.7% while those who referred to it every six months were 17.7%.15.2% never referred to it at all. Therefore, majority of respondents refer to the policy while doing their work.

Table 4.5.1-3: Use of policy documents

Statistics

How Often do you refer to
the policy

N	Valid	68
	Missing	11
Mean		3.06

How Often do you refer to the policy

Reference Point		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never used it at all	12	15.2	17.6	17.6
	Every six months	14	17.7	20.6	38.2
	Every three months	14	17.7	20.6	58.8
	Every Months	14	17.7	20.6	79.4
	Every week	14	17.7	20.6	100.0
	Total	68	86.1	100.0	
Missing	System	11	13.9		
Total		79	100.0		

Frequency Mean of 3.06 based on assumption that the more frequently the ICT policy is used the higher the value to the organization.   This means that weightings are Never use at all=1, used every six months=2, every three months= 3, every month =4 and every week =5 respectively.

Mean average was computed based on a Likert scale of 1-5 by use of $\tilde{x} = \frac{\Sigma fx}{\Sigma f}$ which has to be converted to overall index scale of 1-4 to find the indicator index level. For this purpose this was computed as follows

(3.06/5) *4= 2.448 hence, the readiness index level is 2.45.

Importance of ICT policy in KNEC

Importance of ICT policy was analyzed to determine their influence on implementation of digitization projects. Respondents were requested to tick on the various factors on the Likert scale of 1 to 5.Most important take the value of 5, important take the value of 4, somehow important take the value of 3, not important take the value of 2 and least important take the value of 1.

Statistics

In your opinion, describe impact of ICT policy at KNEC.

N	Valid	73
	Missing	6
Mean		4.26
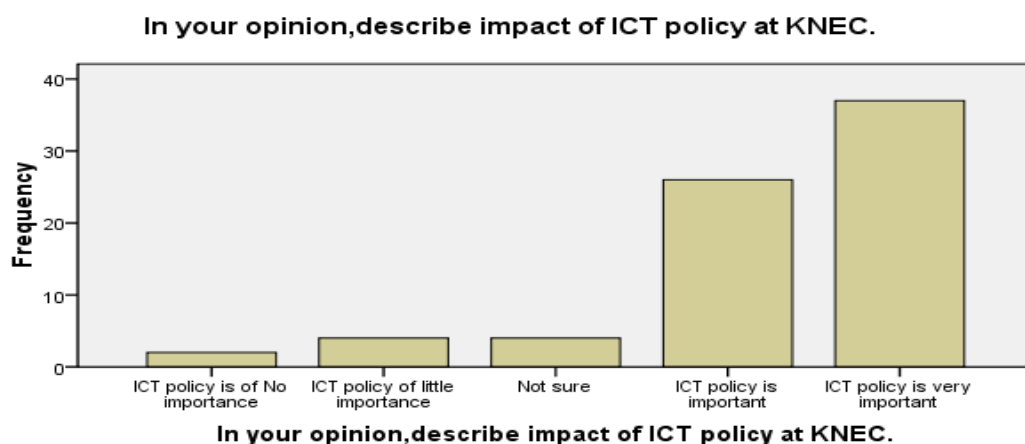
Figure 4.5.1-1 Importance of ICT policy

Mean of 4.26 and an average percentage of 85.2%

The findings' of the study as seen from figure 4.5.1-1 show that those who consider ICT policy as very important were 46.8% while those who consider important were 32.9%. 5.1 % of the respondents said ICT policy is of little Importance, 2.5 % of the respondents said ICT Policy is of no importance while 5.1% of respondents were not sure

On average a mean of 4.26 on a scale of 1-5 was arrived at which is equivalent to 85.2%. Therefore, the majority of respondents consider ICT policy very important. 4.26 was then converted to a scale of 1-4 for digitization scale.ie 4.26/5*4=3.40 .readiness index for policy importance is 3.40

ICT policy indicator readiness index is computed using simple average formula Mean $<x> = \sum x/N$ Of the 3 sub indicators.ie

Indicator	Mean
Awareness index	2.33
Policy referral	2.45
Importance of policy	3.40

$$\frac{2.33+2.45+3.40}{3} = 2.72$$

ICT policy readiness index is 2.72

4.5.2 Team Dynamics Management

Team Dynamics Management was analyzed to determine the influence on implementation of digitization projects. Respondents were requested to tick the various factors on the Likert scale 1 to 5.where Strongly Agree take the value of 5, Agree take the value of 4, Not Sure take the value of 3, Disagree take the value of 2 and strongly Disagree take the value of 1.

From the findings (see Table 4.5.2-1) having clear roles, objectives, and responsibilities are considered important towards overall improvement in team dynamics since their score means are 4.00. Respondents also rated team discussions and working procedure highly at an average score mean of 3.96.in addition, respect and adherence to clear working standards is also rated highly scoring an average mean of 3.75 on the other hand, respondents rated the degree of collaboration among team members during group activity as high at an average of 3.88. For the positive atmosphere in KNEC teams, respondents scored a mean of 3.75.

Table 4.5.2-1 Team Dynamics Management

Team Dynamics		SA	A	NS	D	SD	Mean
Teams members have clear roles, objectives, and responsibilities in all projects	n	21	40	15	3	0	4.00
	%	26.6	50.6	19.0	3.8	0.00	80.0%
Team members generally discuss and agree on the working procedure.	n	20	40	16	2	1	3.96
	%	25.3	50.6	20.3	2.5	1.3	79.2%
There is a high degree of collaboration among team members	n	15	41	13	9	1	3.75
	%	19.0	51.9	16.5	11.4	1.3	75%

Team Dynamics		SA	A	NS	D	SD	Mean
Team members respect and adhere to clear working standards	n	19	37	19	3	1	3.88
	%	24.1	46.8	24.1	3.8	1.3	77.6%
The atmosphere in teams is always positive and friendly	n	17	38	14	8	2	3.75
	%	28.5	48.1	17.7	10.1	2.5	75%

Item means are drawn from means of all items in an indicator. They are computed by use simple average of $<x> = \sum x/N$ to get the indicator mean.ie 4.00+3.96+3.75+3.88+3.75/5=3.86

Item means	4.00	3.96	3.75	3.88	3.75
Indicator mean					3.86
Percentage average					77.2%

3.86 is at a scale of 1-5 which need to be convert to a scale of 1- 4 for readiness index =3.86/5*4=3.09

Average staging at level=3.09
Team dynamics management readiness level =3.09

4.5.3   Culture Change Management

This indicator measured the extent to which willingness to adopt change   influences the level of digitization preparedness.

From the findings (see table 4.5.3-1) majority of staffs enjoy using ICT to solve clients problems and rate this at an average a mean of 4.18. On the other hand, respondents look forward towards using new ICT applications and rating the related indicator at 4.17.   Respondents rated lowly, at 2.01, working with manual records. Most respondents strongly agree that ICT improves their work and rate the indicator at a mean of 4.34. On other hand respondents felt that supervisors would be happy with work done through ICT and rate related indicator at 3.89. Interestingly respondents indicate that they do not fear using ICT rating the question do you fear the use of ICT at 1.5.

Table 4.5.3-1 Culture Change Management

Indicator Question Items		SA	A	NS	D	SD	Mean
I enjoy using ICT to solve clients problems	n	35	34	5	0	5	4.18
	%	44.3	43.0	6.3	0.0	6.3	83.7%

Indicator Question Items		SA	A	NS	D	SD	Mean
I always look forward to using new ICT applications	n	32	36	6	3	2	4.17
	%	40.5	45.6	7.6	3.8	2.5	83.4%
I enjoy working with manual records.	n	7	5	4	29	34	2.01
	%	8.9	6.3	5.1	36.7	43.0	40.2%
Information Technology generally improves my work	n	48	22	1	1	7	4.3
	%	60.8	27.8	1.3	1.3	8.9	86.0%
I, generally, fear the use of ICT to do work	n	5	2	2	13	57	1.5
	%	6.3	2.5	2.5	16.5	72.2	30 %
I feel that by using ICT my supervisor will be happy with my work	n	33	23	12	4	7	3.89
	%	48.1	29.1	15.2	5.1	8.9	77.8%

Each of the question item means were listed. Overall average mean wascomputed using simple average formula ($<x> = \sum x/N$), where x is the item mean and N is the total number of items. The study arrived at an overall means of 3.34 for the Culture Change Management factor.

Item means	4.18	4.17	2.01	4.3	1.5	3.89
Indicator mean						3.34
Percentage average						66.8%

This overall mean of 3.34 was then converted to a scale of 1-4, which is used for readiness index, as =3.34/5*4=2.67
Meaning that aggregated readiness index for Culture Change Management is 2.67 or stage three.

4.5.4   Analysis of ICT governance factor
The indicators for ICT governance were analyzed and plotted on polar curve. Table 4.5.4-1 shows the average means for these indicators.

Table 4.5.4-1: Analysis of ICT governance

Indicator	Mean
ICT Policy	2.72
Team Dynamics Management	3.01
Culture Change Management	2.67

Analyses of these factor on polar chart, as seen in figure 4.5.4-1 shows that the apex for team dynamics management is highest, folowed by ICT policy and lowest is Culture change managemnt. The organization has to put more effort in managing culture change.

Figure 4.5.4-1: Staging ICT Governance Factor
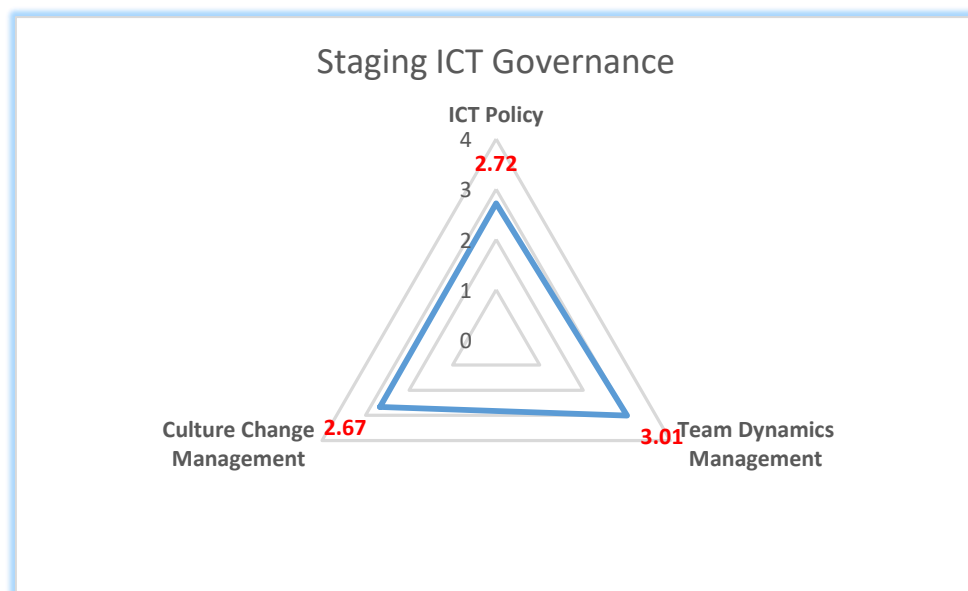
4.6 Technology Readiness Index

This section evaluates the relative progress of an organization towards realizing the internal capacity to carry out digitization. Means and percentages are used to evaluate this.

4.6.1 ICT Hardware Readiness

Table 4.6.1-1 show findings on hardware readiness. Respondents rated adequacy of computers, printers and scanners at 3.60 on Likert scale. Capability of staffs to generate specifications for acquisition of hardware required towards digitization was rated 3.97 and adequacy of storage capacity was rated 4.02.This findings show that staffs are able to generate specifications if required to at the moment. In addition, that storage capacity is adequate. Similarly, the organization is sufficiently equipped with computer hardware.

Table 4.6.1-1 ICT hardware Readiness

Indicator Question Items		SA	A	NS	D	SD	Mean
If KNEC were to undertake digitization, today, it has sufficient ICT hardware in terms of printers, computers, and scanners that can enable successful digitization of all hard copy documents	n	15	33	19	9	3	3.60
	%	19.0	41.8	24.1	11.4	3.8	72.0%
The ICT staffs are capable, to the highest degree, of generating correct specifications for any additional hardware required towards digitization.	n	23	36	15	5	0	3.97
	%	29.1	45.6	19	6.3	0	79.4%
KNEC has, to the highest degree, sufficient capacity to store all her data on external and internal servers	n	29	28	17	5	0	4.02
	%	36.4	35.4	21.5	6.3	0	80.4 %

Finally, means of the three question items, as presented in table 4.6.1, were averaged to generate an overall mean for this indicator. This is computed by use of simple average of, $< x >= \frac{\sum x}{N}$ to get the indicator mean.ie $\frac{3.60+3.97+4.02}{3} = 3.86$

Item means	3.60	3.97	4.02
Indicator mean			3.86
Percentage average			77.2%

Since overall mean of 3.86 is computed from a scale of 1-5 the study has to convert the same to a scale of 1- 4 as used in staging. This is important in generating uniform indices for comparison. For this particular indicator, therefore, the readiness index is computed as $\frac{3.86}{5} \times 4 = 3.08$. Meaning ICT hardware readiness index is 3.08

4.6.2 Software and Information System readiness

Table 4.6.2-1 show the findings of software readiness. The respondents agree that existing software is sufficient to enable successful digitization and rate this at a mean of 3.59. Capability of staffs to Generate correct specifications for any additional software required is rated at 3.63.Respondents, mostly, agree that software is highly documented. This makes it easy to accommodate new changes hence the indicator is rated at 3.29. Adequacy of training programs to enable ease of use for the software is rated at 2.77. Most respondents further agree that support for software applications is very good and rate the indicator at 3.11.

From the findings software readiness is highly rated this is not surprising given that KNEC has undertaken numerous projects to automate her services.

Table 4.6.2-1 software and information readiness index

Indicator Question Items		SA	A	NS	D	SD	Mean
If KNEC were to undertake digitization, today, it has sufficient existing computer software applications that can enable successful digitization of her records.	n	15	32	20	9	3	3.59
	%	19.0	40.5	25.3	11.4	3.8	71.8%
KNEC staffs are capable, to the highest degree, of generating correct specifications for any additional software that is required towards digitization.	n	15	34	18	10	2	3.63
	%	19.0	43.0	22.8	12.7	2.5	72.6%
The existing software is highly documented making it easy to modify and accommodate new changes where necessary.	n	8	23	35	10	3	3.29
	%	10.1	29.1	44.3	12.7	3.8	65.8 %
Existing training programs on new application areas are adequate to enable ease of use for the software.	n	4	16	28	20	11	2.77
	%	5.1	20.3	35.4	25.3	13.9	55.4%
Existing support for software applications is very good; we always get our problems solved in less than 24 hours.	n	8	23	26	14	8	3.11
	%	10.1	29.1	32.9	17.7	10.1	62.2%

Five question items, shown in table 4.2.6-1, were averaged to generate an overall mean for this indicator. They are computed by use of simple average formula, $< x >= \frac{\sum x}{N}$ to derive the indicator mean. Such that when formula is substituted with the figures it gives $\frac{3.59+3.63+3.29+2.77+3.11}{5} = 3.27$ as the overall mean.

Item means	3.59	3.63	3.29	2.77	3.11
Indicator mean					3.27
Percentage average					65.4%

This overall mean is then converted from a scale of 1-5 used on a Likert scale to its equivalent on a scale of 1- 4 used in staging. For this particular indicator, the readiness index is computed as $\frac{3.27}{5} \times 4 = 2.61$.   Software and Information System readiness index is 2.61 this is stage 3 in our readiness index.

4.6.3   ICT Infrastructure Readiness Index

This index assesses readiness of an organization in terms of abilities in usage of her ICT infrastructure and the levels of deployment of internet.

Table 4.6.3-1 shows the findings on; adequacy of; existing fixed phones to meet communication needs and internet speeds. In addition to willingness to increase internet bandwidth.

The results show that most respondents agree, at a mean of 2.94, that existing fixed line phones meet communication needs. On the speed of internet respondents, rate the indicator at a mean of 4.03. While willingness to increase internet bandwidth was rated 3.69.

Table 4.6.3-1: ICT infrastructure readiness index

Indicator Question Items		SA	A	NS	D	SD	Mean
The existing fixed phones in our offices sufficiently meet communication needs.	N	5	34	9	14	17	2.94
	%	6.3	43.0	11.4	17.7	21.5	58.8%
All offices are equipped with fast internet accessed on computers	N	29	32	10	8	0	4.03
	%	36.7	40.5	12.7	10.1	0	80.6%
	N	18	29	24	6	2	3.69

Indicator Question Items		SA	A	NS	D	SD	Mean
KNEC is always willing to increase internet bandwidth Whenever complaints are raised over slow speed	%	22.8	36.7	30.4	7.6	2.5	73.8 %

Means of the three question items were averaged to generate an overall mean for this ICT infrastructure indicator. Like all computations seen earlier, the overall mean is computed by use of simple average. As such $\frac{2.94+4.03+3.69}{3} = 3.55$ is the mean

Item means	2.94	4.03	3.69
Indicator mean			3.55
Percentage average			71%

To compute the readiness index this mean is converted to a scale of 1-4 like in all previous cases. This is achieved as $\frac{3.55}{5} \times 4 = 2.84$. Therefore, the ICT infrastructure readiness index is 2.84 that is considered to be at stage 3 on the overall readiness index.

4.6.4   Analyzing Technology Readiness factors

Technology readiness factor was analyzed by assessing the rated means from the three indicators shown on table 4.6.4-1.the overall means were plotted on polar curve. Figure 4.6.4-1 shows the average means for these indicators.

Indicator	Mean
ICT Hardware Readiness	3.08
Software and Information System Readiness	2.61
ICT Infrastructure Readiness	2.84

Analysis on this factor shows that ICT hardware was the highest followed by ICT infrastructure and the lowest software and information system. These results shows that organization has to develop documentations.

In terms of ICT infrastructure, although fixed phones is rated lowest this might not mean that they are inadequate. With the advent of mobile phones, increasingly more and more people use mobile phones while communicating at work.

Figure 4.6.4-1 Technology readiness indicators
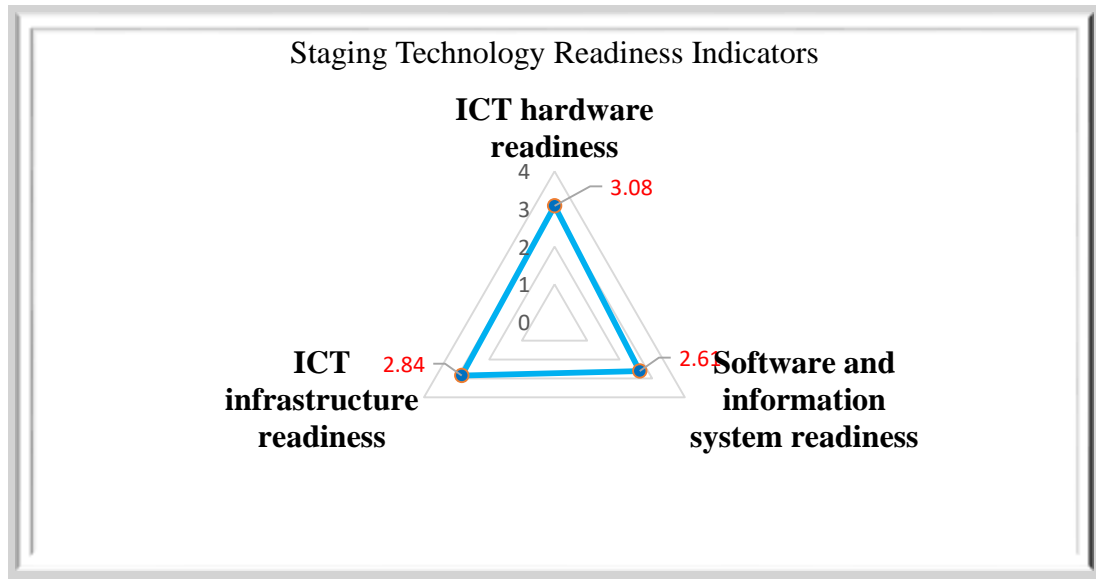
4.7 Competency Readiness Index

This section measures skill sets required to undertake digitization. The section assessed employee skill set capacity in terms of work experience adequacy and the necessary exposure to ICT tools.

4.7.1 ICT Set Skills

Table 4.7.1-1 shows responses for the ICT set skill questions items. Regular training and seminars for skills upgrade in ICT is rated lowly at a mean of 2.5 and the extent at which is required support to undertake ICT related work Respondents was also rated at 2.6. While their possession of technical skills for participating in digitization, is highly at a mean of 3.4.

Table 4.7.1-1 ICT set skills

Indicator Question Items		SA	A	NS	D	SD	Mean
KNEC, regularly, offers training and seminars on ICT related courses for skills upgrade	n	1	22	15	23	18	2.55
	%	1.3	27.8	19.0	29.1	22.8	50.0%
If identified to participate in digitization, I have Relevant technical skills required.	n	11	38	10	12	8	3.40
	%	13.9	48.1	12.7	15.2	10.1	68.0%
While doing ICT related work, I always depend on support	n	4	22	9	27	17	2.60
	%	5.1	27.8	11.4	34.2	21.5	52.0 %

Further, the average mean of the three question items presented in table4.7.1-1, is computed by use of simple average $< x >= \frac{\sum x}{N}$

Item means	2.55	3.40	2.60
Indicator mean			2.85
Percentage average			57%

As such $\frac{2.55+3.40+2.60}{3} = 2.85$ is the average mean.

To compute the readiness index for ICT set skills the average mean is converted to a scale of 1-4 like in all previous cases as $\frac{2.85}{5} \times 4 = 2.28$. Therefore, the ICT set skills readiness index of 2.28, is considered stage three.

Supportive Competences

This aspect was assessed to get the area of specialization, which would be required during digitization. The findings of the study shows that all specialization are well represented in case of digitization readiness. Supervisory skills has the highest number while network installation has the lowest.

Table 4.7.1-2: Supportive Competences

Area of specialization	Descriptive Statistics			
	Selected	Not Selected	Mean	Std. Deviation
Supervisory skills	44	35	0.55	0.49
Project management skills	28	51	0.35	0.48
Problem formulation skills	24	55	0.30	0.46
Systems implementation	21	58	0.26	0.44
Network Installation	3	76	0.13	0.34
Systems Specification	19	60	0.24	0.43
System Support	24	55	0.30	0.46
Overall		**79**	**0.30**	0.46

Annual Appraisal System

This aspect was assessed to check whether annual appraisal system adequately addresses training needs. The study findings on figure 4.7.1-1 shows that respondents who believe that the annual appraisal system adequately addresses their ICT training needs indicated that, no respondents indicated

on to a very large extent, 12.7 % of the respondents believe to a large extent, 12.7% were not sure, 43% believe to a small extent while 31.6% do not believe at all

Statistics

Annual appraisal system adequately addresses my ICT training needs

N	Valid	79
	Missing	0
Mean		2.0633
Std. Deviation		.97851
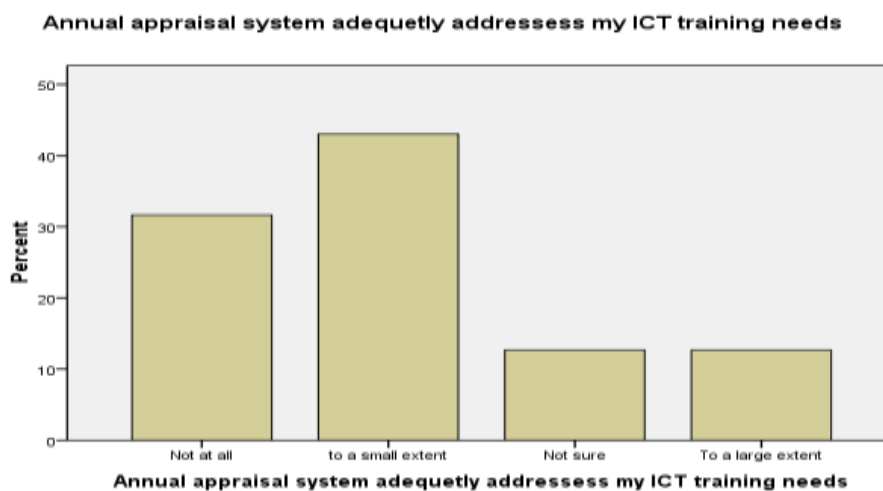
Overall mean of 2.06 was attained .this is at a scale of Likert scale of 1-5. For purpose of Staging, 2.06 has to be converted to a scale of 1-4 .therefore,

$$\frac{2.06}{5} X4 = 1.64$$

Since ICT set skills had three question items, they were averaged to generate an overall mean for this indicator. This is computed by use of simple average of, $< x >= \frac{\sum x}{N}$ to get the indicator mean.

ICT set skills=2.28

Annual appraisal system=1.64

i.e. $\frac{2.28+1.64}{2}$ = 1.96,   Overall Mean for ICT set skills =1.96

4.7.2   Learnability Readiness

This aspect was to assess whether staffs had interest in learning new technologies. This was done by testing the last time staffs upgraded their ICT skills, relevance of the training and their preferred mode of learning.

Last upgrade of ICT skills

The study findings on table 4.7.2-1 shows the last time respondents upgraded their skills in ICT. 34.2 % of respondents have never upgraded their skills, 17.7 % did it less than six months ago, 13.9% One year ago, 10.1% Two years ago and 24.1% upgraded Three years ago. The findings of the study are that the overall rating was at a mean of 2.7 corresponding to 54.0%.From the findings majority of respondents have at one point upgraded their skills.

Statistics

last upgrade of ICT skills

N	Valid	79
	Missing	0
Mean		2.7215
Std. Deviation		1.60077

Table 4.7.2-1: Last Upgrade of ICT skills

Last upgrade of ICT skills

ICT Skills		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	27	34.2	34.2	34.2
	less than six months	14	17.7	17.7	51.9
	one year ago	11	13.9	13.9	65.8
	two years ago	8	10.1	10.1	75.9
	Three years ago	19	24.1	24.1	100.0
	Total	79	100.0	100.0	

Overall mean of 2.7 was attained .this is at a scale of Likert scale of 1-5. For purpose of Staging, 2.7 has to be converted to a scale of 1-4.

$\frac{2.7}{5} X4 = 2.16$. Last upgrade of ICT skills=2.16

Skills Upgrade Relevance

This aspect was testing how relevant the upgrading of ICT skills.

The study findings on table 4.7.2-2 shows that 26.6%of respondents found it very relevant 30.4% found it relevant, 10.1% were not sure, 10.1 % (n=8) of respondents found it Somehow Relevant and 1.3 % found it irrelevant. The overall rating was 3.9 corresponding to 78%.From the findings majority of respondents felt that the upgrade was worth.

Table 4.7.2-2: Training relevance

Statistics

Training relevance

N	Valid	62
	Missing	17
Mean		3.9032
Std. Deviation		1.06678

Training relevance

Relevance		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Irrelevant	1	1.3	1.6	1.6
	Somehow Relevant	8	10.1	12.9	14.5
	Not sure	8	10.1	12.9	27.4
	Relevant	24	30.4	38.7	66.1
	Very relevant	21	26.6	33.9	100.0
	Total	62	78.5	100.0	
Missing	System	17	21.5		
Total		79	100.0		

Overall mean of 3.9 was attained. This is at a scale of Likert scale of 1-5. For purpose of Staging, 3.9 has to be converted to a scale of 1-4.

Therefore, $\frac{3.9}{5}X4 = 3.12$ .Skills upgrade relevance is 3.12

Preferences in learning modes

This aspect was testing the preferred mode of learning.

Respondents were asked to choose their preferred mode of learning as seen in table 4.7.2-3 indicates that 8.9 % of respondents preferred reading a book. 16.5 % of respondents preferred online learning, 8.9% of respondents preferred practicing a concept with a colleague. 32.9% taking a formal class while 31.6% of respondents preferred attending a workshop.

The overall rating was at a mean of 3.6 corresponding to 72%.This means Majority of respondents felt that they prefer taking formal class followed by those who would prefer attending a workshop. This means when KNEC want to upgrade skills they should organize for a workshop or send staff to classroom.

Statistics

preferred mode of learning

N	Valid	78
	Missing	1
Mean		3.6282
Std. Deviation		1.33006

Table 4.7.2-3: preferred mode of learning

Preferred mode of learning

	Mode of Learning	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Reading a book	7	8.9	9.0	9.0
	Online learning	13	16.5	16.7	25.6
	practice a concept with a colleague	7	8.9	9.0	34.6
	Taking a formal class	26	32.9	33.3	67.9
	Attending a workshop	25	31.6	32.1	100.0
	Total	78	98.7	100.0	
Missing	System	1	1.3		
Total		79	100.0		

Overall mean of 3.6 was attained. This is at a scale of Likert scale of 1-5. For purpose of Staging, 3.6 has to be converted to a scale of 1-4.

Therefore, $\frac{3.6}{5} X4 = 2.88$ .preferred mode of learning is 2.88

Since learnability indicator has three question items, they were averaged to generate an overall mean for this indicator. This is computed by use of simple average of, $< x >= \frac{\sum x}{N}$ to get the indicator mean.

Last upgrade of ICT skills=2.16

Skills upgrade relevance =3.12

Preferred mode of learning=2.88

i.e. $\frac{2.16+3.12+2.88}{3} = 2.72$

Overall Mean of learnability =2.72

4.7.3 Agility readiness

The indicator measures the degree to which KNEC staff are agile to changes and the degree to which this can influence digitization readiness. The study findings on table 4.7.3-1 shows that, respondents who are always certain of required work every day was rated 4.27. Those who conclude tasks allocated to them every day was rated 4.16.Respondents who agree that digitizing all hard copy documents will ease work was rate 4.26,and those who always encounter scenarios requiring them to learn new knowledge to perform a task was rated 3.94.

Table 4.7.3-1: Agility readiness

Indicator Question Items		SA	A	NS	D	SD	Mean
To the highest degree, I am always certain of what work is required of me every day.	n	38	34	2	1	4	4.27
	%	48.1	43	2.5	1.3	5.1	85.4%
To the highest degree, I conclude tasks allocated to me every day	n	29	40	5	4	1	4.16
	%	36.7	50.6	6.3	5.1	1.3	83.2%
I am sure, to the highest degree that by digitizing all hard copy documents my daily work will be easier.	n	40	26	8	4	1	4.26
	%	50.6	32.9	10.1	5.1	1.3	85.2 %

Indicator Question Items		SA	A	NS	D	SD	Mean
During the course of my work, I always encounter scenarios where I am required to learn new knowledge to perform a task.	n	26	38	1	13	1	3.94
	%	32.9	48.1	1.3	16.5	1.3	78.8%

Means of the four question items were averaged to generate an overall mean for this agility indicator. The overall mean is computed by use of simple average. As such $\frac{2.94+4.03+3.69}{3} = 3.55$ is the mean

Item means	4.27	4.16	4.26	3.94
Indicator mean				4.15
Percentage average				83.1%

To compute the readiness index, overall mean is converted to a scale of 1-4 like in all previous cases. This is achieved as $\frac{4.15}{5} \times 4 = 3.32$. Therefore the agility readiness index is 3.32 which is considered to be at stage 4 on the overall readiness index.

4.7.4 Analysis of Competency Readiness Factor

Computing the competency readiness factor and its respective index for readiness is by analyzing means of three indicators; ICT set skills, learnability and agility shown in table 4.7.4-1.

Table--4.7.4-1: indicators for competence readiness

Indicator	Mean
ICT set skills	1.96
Learnability	2.72
Agility	3.32

Figure4.7.4-1 is an analysis of the indicators. Each indicator is determined by respective height of aperture of the triangle. I this case agility is rated highest, at a mean of 3.32, followed by learnability at 2.72, while ICT set skills is lowly rated at a mean of 1.96. These results indicate that KNEC is highly agile in managing ICT projects. On the other hand, the appraisal systems need to be strengthened and aligned to training needs.
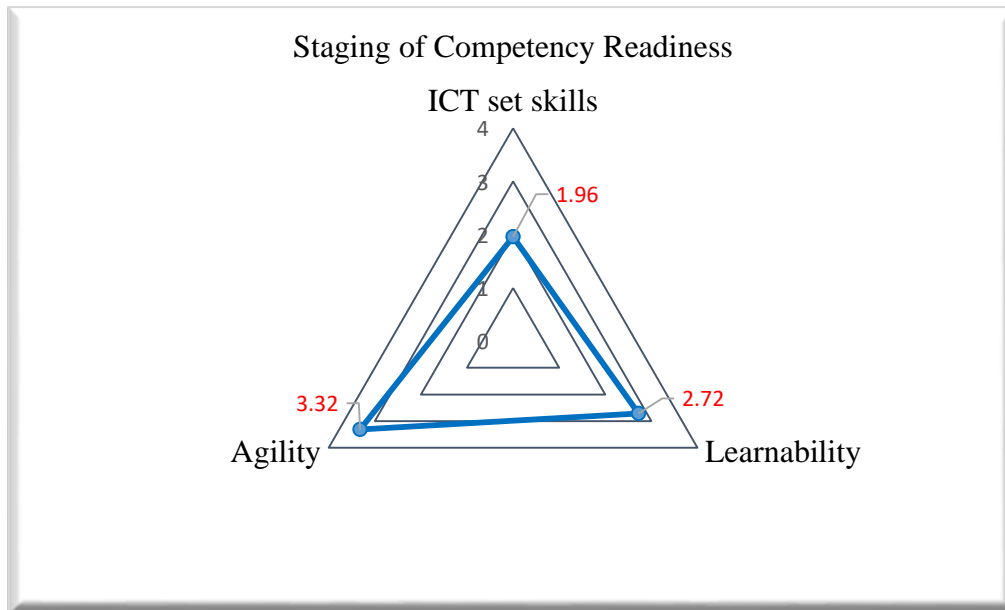
Figure 4.7.4-1 Staging Competency Readiness

4.8   ICT Security

This section assesses the progressive made towards securing ICT asset. The study evaluated data security policy, access control, and security trust and system backups.

4.8.1   Data Security and Disposal/Policy awareness

Table 4.8.1-1 is analysis of responses on awareness about Data Security and Disposal/Policy. 55.7% of respondents are aware while 43 % of the respondents were not aware. Suggesting that majority of staff are aware of this policy.

Table 4.8.1-1 : Data security and disposal policy awareness

Awareness of KNEC data security and disposal policy

	Policy Awareness	Frequency	Percent	Valid Percent	Mean
Valid	Yes	44	55.7	56.4	2.6364
	No	34	43.0	43.6	2.7059
	Total	78	98.7	100.0	2.6667
Missing	System	1	1.3		
Total		79	100.0		

Perception on ICT Security and Disposal Policy.

Security is an important aspect of any examination management process. It was therefore important to understand how participants perceive the ICT security/disposal policy. The findings show that, table 4.8.2-1, respondents consider that the way security policy is written can easily be understood rating this at a mean of 3.5. On the importance employee trainings on data security, most respondents either strongly agree or agree rating this highly at 4.3. Another indicator to be rated highly was the importance of review to existing security policy to minimize threats and risks to data rated 4.06. On the other hand, respondents felt that dedicating an office to manage information and data security would assure assets security and rated this at 4.25.

Table 4.8.1-2: Perception of ICT security and disposal policy

Indicator Question Items		SA	A	NS	D	SD	Mean
To the highest degree, the KNEC security policy is written in a way that can be understood by the majority of staff.	n	15	24	25	6	4	3.5
	%	19.0	30.4	31.6	7.6	5.1	70%
Training employees on the security of data is critical for their work performance in KNEC.	n	38	30	4	0	2	4.3
	%	48.1	38.0	5.1	0	2.5	86%
If the existing security policy were to be reviewed, we shall minimize threats and risks to data.	n	25	31	16	2	0	4.06
	%	31.6	39.2	20.3	2.5	0	81.2 %
Dedicating an office to manage information and data security assures that these assets are secure	n	30	35	7	2	0	4.25
	%	38.0	44.3	8.9	2.5	0	85.0%
I consider training in data and information security as important to the digitization process in KNEC.	n	36	34	4	0	0	4.43
	%	45.6	43.0	5.1	0	0	88.6%

Mean of means of the five question items, was computed using simple average as $\frac{3.5+4.3+4.06+4.25+4.43}{5} = 4.10$. The table 4.5.2.1 is illustration of the same.

Item means	3.5	4.3	4.06	4.25	4.43
Indicator mean					4.10
Percentage average					82%

The overall mean helped determine the readiness index. In order to do this the overall mean is converted to a scale of 1-4, like in all previous cases, such that $\frac{4.10}{5} \times 4 = 3.28$. Therefore, the ICT security/disposal policy is 3.28. This according to the staging parameters is considered stage 4 for purposes of determining the readiness index.

4.8.2   Access Control on ICT security

This aspect assesses efforts put in place to manage authentication and authorization for access to critical systems core to data protection. The findings in table 4.8.2-1 shows that respondents strongly agreed/agreed that restricting unauthorized personnel to the data center can improve security of digital records rating this at a mean of 4.5. Respondents also strongly/agree, rating this at 4.41, that use biometric systems improves secure access in segregated Examination processing areas. While adequacy of ICT security installed in KNEC to control any security breach rated at 3.5 shows that majority of respondents are not sure this measures are adequate.

Table 4.8.2-1: Access Control on ICT security

Indicator Question Items		SA	A	NS	D	SD	Mean
Restricting un-authorized personnel to the data center can improve security of digital records.	n	48	28	1	2	0	4.5
	%	60.8	35.4	1.3	2.5	0	90%
Additional access controls like the use of biometric put in place in segregated Examination processing areas (ICT offices, Exam processing rooms, exam printing rooms, test development, and manuscript) improves the credibility of digitized records.	n	45	27	3	3	1	4.41
	%	57.0	34.2	3.8	3.8	1.3	88.2%
The ICT security installed in KNEC is sufficient to control any security breach.	n	14	27	27	8	3	3.5
	%	17.7	34.2	34.2	10.1	3.8	70.0 %

Means of the three question items were averaged to generate an overall mean for this access control indicator. The overall mean is computed by use of simple average. As such $\frac{4.50+4.41+3.50}{3} = 4.13$ is the mean

Item means	3.5	4.3	4.06
Indicator mean			4.13
Percentage average			82.6%

To compute the readiness index, overall mean is converted to a scale of 1-4 like in all previous cases. This is achieved as $\frac{4.13}{5} \times 4 = 3.30$. Therefore the ICT Access control is 3.30 which is considered to be at stage 4 on the overall readiness index.

4.8.3   Security trust

This study measured security trust to discover how much confidence staffs had in security in systems and controls. Table 4.8.3.1 show findings about the security trust. The results show that respondents believe strengthening of password improves data security and rate this item at a mean of 4.30. Respondents relate secure systems to increasing their trust in digitization rated at 4.43. Respondents believe transacting data via the Internet is secure and protected enough rated this at 3.48. In addition, whether KNEC information systems are prone to hacking most respondents felt otherwise rating this at 2.77.

Table 4.8.3-1: Security Trust

Indicator Question Items		SA	A	NS	D	SD	Mean
I believe strengthening of password improves the security of data.	n	36	35	5	2	1	4.30
	%	45.6	44.3	6.3	2.5	1.3	86%
If Systems are Secure, this will improve trust in digitization.	n	42	32	3	1	1	4.43
	%	53.2	40.5	3.8	1.3	1.3	88.6%
I believe transaction data transferred over the Internet is securely protected.	n	16	24	25	10	4	3.48
	%	20.3	30.4	31.6	12.7	5.1	69.6 %
KNEC information systems are prone to hacking.	n	6	12	32	16	13	2.77
	%	7.6	15.2	40.5	20.3	16.5	55.4 %

Means of the four question items, as presented in table23, were averaged to generate an overall mean for this access control indicator. The overall mean is computed by use of simple average. As such $\frac{4.3+4.43+3.48+2.77}{4} = 4.13$ is the mean

Item means	4.3	4.43	3.48	2.77
Indicator mean				3.74
Percentage average				74.8%

To compute the readiness index, overall mean is converted to a scale of 1-4 like in all previous cases. This is achieved as $\frac{3.74}{5} \times 4 = 2.99$. Therefore, the security trust is 2.99, which is considered to be at stage 3 on the overall readiness index.

4.8.4   Data Backup

The study measured whether system backup ensures availability of services. Table 4.8.4-1 shows the findings on system backup. The results show that majority of respondents agreed that digitized records are easily backed up and consequently stored. This item is highly rated at a mean of 4.24. Equally, respondents agree that verification of backed up data is important and rate this at 4.46. On the importance of backup as very important means for controlling loss of data in digital ecosystems, most respondents strongly agree/ agree by rating this item at a mean of 4.55. On off-site backups, enhancing digital security, most respondents rated this highly at 4.46. The findings show that the backing up of data is critical aspect towards improving confidence and trust in digitization projects.

Table 4.8.4-1: Data backup

Indicator Question Items		SA	A	NS	D	SD	Mean
To the highest degree, once KNEC data is digitized it will become easy to backup and store	n	37	30	7	1	3	4.24
	%	46.8	38.0	8.9	1.3	3.8	84.8%
Verification of backed up data is important to ascertain that the data is safe and complete.	n	47	24	5	0	2	4.46
	%	59.5	30.4	6.3	0	2.5	89.2%
Data Backup is very important for any digitized data to control data loss in case of system failure	n	50	23	4	0	1	4.55
	%	63.3	29.1	5.1	0	1.3	91.0 %
Backing up data in an off-site location enhances digital security and helps in business continuity in case of disaster. .	n	46	24	7	0	1	4.46
	%	58.2	30.4	8.9	0	1.3	89.2 %

Means of the four question items were averaged to generate an overall mean for this access control indicator. The overall mean is computed by use of simple average as $\frac{4.24+4.46+4.55+4.46}{4} = 4.13.$

Item means	4.24	4.46	4.55	4.46
Indicator mean				4.42
Percentage average				88.4%

To compute the system backup index, this overall mean is converted to a scale of 1-4 like in all previous cases as $\frac{4.42}{5} \times 4 = 3.53$. Therefore, the system backup readiness index is 3.53.

### 4.8.5   Analysis of ICT Security Factor

The overall ICT security readiness is evaluated to generate an index. This shows the level of readiness for this factor. To do this each of the factors, under this index, was rated and the corresponding mean determined (see table 4.8.5-1.)

Staging ICT Security indicators Factor

Indicators	Mean
ICT security/disposal policy	3.28
Access control	3.30
Security trust	2.99
Data backup	3.53

Accordingly data backup was rated highest, at 3.53 mean, while trust in security was lowest rated at 2.99 mean this is reflected on the vertices of a polar curve see figure 4.8.5-1

Figure 4.8.5-1: Staging ICT Security indicators Factor
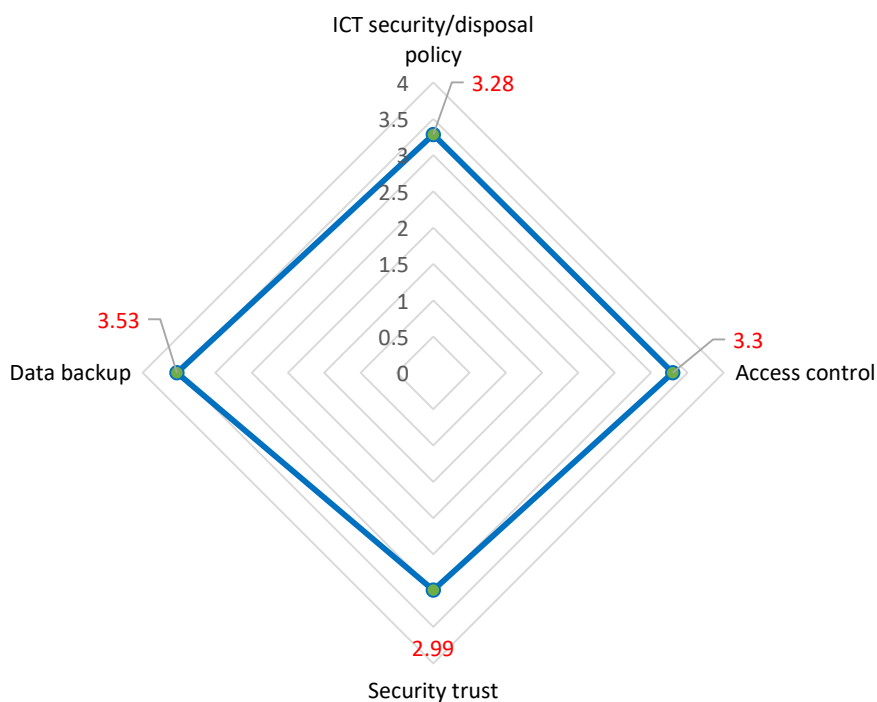
Accordingly, respondents perceive that a lot more progress has been made to backup data, controlling access, develop policy compared to developing trust in secure systems. These results imply security trust is an issue of concern to participants. Specifically, respondents do not trust digital records. Moreover, majority consider data transferred via the Internet not to be secure. In similar fashion, 22.8% of the respondents strongly agree or agree that information systems is prone to hacking.

4.9 Organization Readiness Index

Support required from top management in terms of mobilizing resources was examined under the organization readiness index.

4.9.1 Top Management Support

The results as tabulated, Table 4.9.1, show how respondents rated various question items under the same. Consequently, the existing standards for projects having clear goals and guidelines was rated at a mean of 3.67. At the same time, participants generally agree that the success of digitization is associated to management's assignment of duties. Respondents agree, at a mean of 3.83 that digitization process can improve greatly if management strictly assign duties within the existing structures. Additionally, respondents rate adequacy of performance reward mechanism at 3.13. Respondents agree that risk mitigation and it is facilitation by management can improve digitation rating this at 3.36. Moreover, regular briefs by management is important overall towards successful digitization rating this at a mean of 3.96.

Table 4.9.1-1: Top Management Support

Indicator Question Items		SA	A	NS	D	SD	Mean
The existing standards for projects in general, as set by management in KNEC, have clear goals and guidelines and can adequately support digitization	n	14	30	31	3	1	3.67
	%	17.7	38.0	39.2	3.8	1.3	73.4%
If Management assigns duties strictly within the existing structures this can make digitization successful.	n	17	40	16	6	0	3.83
	%	21.5	50.6	20.3	7.6	0	76.6%
The existing performance reward mechanism is adequate for successful digitization.	n	6	27	27	10	9	3.13
	%	7.6	34.2	34.2	12.7	11.4	62.6 %
Management provides optimal resources sufficient for mitigating risks associated with digitization.	n	5	35	27	8	4	3.36
	%	6.3	44.3	34.2	10.1	5.1	67.2%
Regular briefs to the management on progress can enhance successful digitization.	n	18	42	18	0	1	3.96
	%	22.8	53.2	22.8	0	1.3	79.2 %

The Means of the five question items, were aggregated to an overall mean as $\frac{4.24+4.46+4.55+4.46}{5} = 3.59$, which represents the top management readiness indicator.

Item means	3.67	3.83	3.13	3.36	3.96
Indicator mean					3.59
Percentage average					71.9%

This overall mean is converted to a scale of 1-4 like in all previous cases as $\frac{3.59}{5} \times 4 = 2.87$. Therefore, Organization Readiness Index is 2.87, should be considered to be at stage3 on the overall readiness index.

4.9.2   Resource Mobilization

In order to determine the relative readiness of the financial, fiscal, human and technological resources an assessment of Resource mobilization was undertaken. Each individual indicator was evaluated and a mean determined. These means were aggregated to generate an overall average. This compounded mean determines the readiness index for this particular factor as follows. First, the findings on specific question items were tabulated as in table 4.9.2-1. Briefly, among the key issues, respondents though were resource mobilization and needs assessment at a mean of 3.58. They further concur that KNEC is ready, using her trained staff, to carry out digitization project successfully rating this at a mean of 3.60. Additionally, most respondents believe that the national Government is willing to support digitization in KNEC and rate this at 3.45. They further perceive collaboration between KNEC and its development partners (World Bank) is good enough to support successful digitization and rate this at 3.74.

Table 4.9.2-1: Resource mobilization

Question Items		SA	A	NS	D	SD	Mean
The existing need assessment survey for KNEC is able to mobilize resources to undertake digitization successfully	n	12	33	27	3	4	3.58
	%	15.2	41.8	34.2	3.8	5.1	71.6%
Using the current trained ICT staff, KNEC is ready to carry out digitization project successfully.	n	12	38	19	6	4	3.60
	%	15.2	48.1	24.1	7.6	5.1	72.0%
The National Government is willing to support digitization in KNEC.	n	10	20	46	2	1	3.45
	%	12.7	25.3	58.2	2.5	1.3	69 %
The collaboration between KNEC and its development partners (world bank) is good enough to support successful digitization	n	17	30	29	1	2	3.74
	%	21.5	38.0	36.7	1.3	2.5	74.8%

The means of the four question items were averaged to generate an overall mean for this access control indicator. The overall mean is computed by use of simple average. As such $\frac{4.24+4.46+4.55+4.46}{5} =$ 3.59 is the mean

Item means	3.58	3.60	3.45	3.74
Indicator mean				3.59
Percentage average				71.8%

To compute the system backup index, overall mean is converted to a scale of 1-4 like in all previous cases. This is achieved as $\frac{3.59}{5} \times 4 = 2.87$. Therefore, the resource mobilization support is 2.87 which is considered to be at stage3 on the overall readiness index.

4.9.3   Analysis of Organization Readiness

Organization readiness measures preparedness to accurately link organizational IT efforts and expected outcomes. This aspect was assessed to evaluate the organization readiness to begin a project, which looks at top management support and resource mobilization.
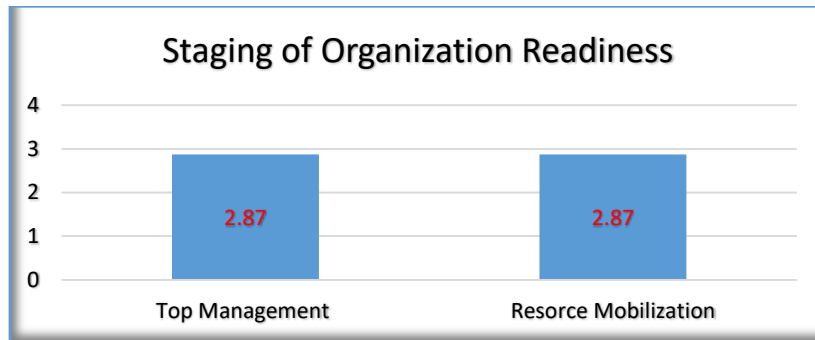

Figure 4.9.3-1 Staging Organization Readiness

From the analysis of both indicators, they seem to have the same   .see figure 4.9.3-1

Strength, which is at stage 3.

4.10   Digitization Readiness Factors Ranking

These factors proposed in the framework were ranked from highest to the lowest, using descriptive statistics to evaluate criticality of each factor that promote digitization readiness. Results were presented by use of frequency means and standard deviation. Respondents were requested to rank factors on a Likert scale 1 to 5. Most Critical take the value of 5, : Critical take the value of 4, Not sure take the value of 3, less critical take the value of 2 and least critical take the value of 1. The findings indicate that ICT governance was the highest ranked as critical while ICT security was ranked lowest.

 The illustration of results is shown in Table 4.10.-1. 1.

Table 4.10-1: Ranking of factors

Descriptive Statistics

Factor Ranking	Mean	Std. Deviation	Analysis N[a]	Missing N
ICT Governance	4.8205	3.44057	78	0
Technology readiness	4.4615	0.76773	78	0
Competency readiness	4.4487	0.78372	78	0
Organizational readiness	4.4231	0.79804	78	0
ICT security readiness	4.3974	0.88772	78	0

4.10.1 Ranking of Digitization Readiness indicators ranking

Table 4.10.1-1 shows the ranking, by respondents, of the fifteen indicators proposed in the conceptual model. Each respondent was required to rank an indicator, on a scale of 1-5, it importance towards digitization.   According, among the most important factors according were top management support and hardware readiness

Table 4.10.1-1: ranking of indicators

Descriptive Statistics

Indicators Ranking	Mean	Std. Deviation	Analysis N[a]	Missing N
Top management support	4.7067	.53960	75	0
Hardware readiness	4.6267	.63189	75	0
ICT set skills	4.6081	.58858	75	1
Software readiness	4.5867	.54756	75	0
System backups	4.5733	.66115	75	0
ICT policy and strategy	4.5541	.59598	75	1
ICT infrastructure	4.5467	.66360	75	0
Resource Mobilization	4.5467	.74059	75	0
Learnability	4.5333	.57735	75	0
Agility	4.5067	.64459	75	0
Team dynamics management	4.4933	.72360	75	0
Access control measures	4.4933	.68524	75	0
ICT security trust	4.4800	.77738	75	0
Data security and Disposal policy	4.4400	.70212	75	0
Culture change management	4.4000	.71660	75	0

4.10.2 Principal component Analysis on factor indicators

In order to interpret large datasets, Principal Component Analysis (PCA) drastically reduces their dimensionality in an interpretable way Joliffe and Cadima, (2016). The study, thus, used PCA to reveal underlying factors among indicators (see table 4.10.2.-1). To improve reliability of PCA, according to Field (2009), Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy should be greater than 0.5 for bare minimum. For this analysis, KMO was .857 and KMO values for individual items were to be greater than .5, as acceptable sampling adequacy. Bartlett's test of sphericity was 567.18. P<0.001, indicated that correlation between items was sufficiently large for PCA. Consequently, an analysis to obtain eigenvalues for each component in the data was undertaken. Three components had eigenvalues over Kaiser's criterion of one, showing clustering of items along three components. The clustered components were identified as either "Most critical", 'Critical" and less critical" towards digitization. See table 4.10.2-1

Component Correlation Matrix

Component	1	2	3
1	1.000	.462	.350
2	.462	1.000	.192
3	.350	.192	1.000

Extraction Method: Principal component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.857
Bartlett's Test of Sphericity	Approx. Chi-Square	567.188
	Df	105
	Sig.	.000

Table 4.10.2-1: Principal Component Analysis

Indicators	Component		
	1	2	3
Team dynamics management	.827		
Agility	.802		
Learnability	.789		
Top management support	.745		
Resource Mobilization	.682		
Data security and Disposal policy	.637		
ICT set skills			
System backups		.845	
ICT security trust		.789	
ICT policy and strategy		.779	
Access control measures		.653	
Culture change management			
Software readiness			.808
Hardware readiness			.643
ICT infrastructure			.559

Extraction Method: Principal Component Analysis.

 Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 10 iterations.

4.11   Summary of findings

Table 4.11-1, summarizes the overall findings of digitization readiness assessment. Implying cumulatively, that the overall digitization readiness for KNEC stands at 2.88. This means its overall level of preparedness to undertake digitization is at Level 3 on the readiness index.

Table 4.11-1 Summary of average Scores

Factor	Indicator	Mean Average	Total Average
ICT Governance	ICT Policy	2.72	2.8
	Team Dynamics Management	3.01	
	Culture Change Management	2.67	
Technology Readiness	ICT Hardware Readiness	3.08	2.84
	Software and Information System Readiness	2.61	
	ICT Infrastructure Readiness	2.84	
Competency Readiness	ICT set skills	1.96	2.66
	Learnability	2.72	
	Agility	3.32	
ICT security	ICT security/disposal policy	3.28	3.27
	Access control	3.30	
	Security trust	2.99	
	Data backup	3.53	
Organization Readiness	Top Management support	2.87	2.87
	Resource Mobilization	2.87	

4.12   Presentation of Digitization factor Indices

To explain easily digitization readiness assessments, it is important to visual summaries in a model for ease of interpretation Ouma et al. (2013). This study also visualized the summaries of indicators as shown in figure 4.12-1. Accordingly, indictors that scored below 2.5 mark average are considered not ready for undertaking digitization. As seen in the model, the study findings depicts that all the factors are above the minimum expected level of readiness. Thurs, over a period, KNEC has achieved significant level of preparedness towards digitization in all factors.

Figure 4.12-1 Digitization readiness Scale by researcher based on (Ouma et al. 2013)
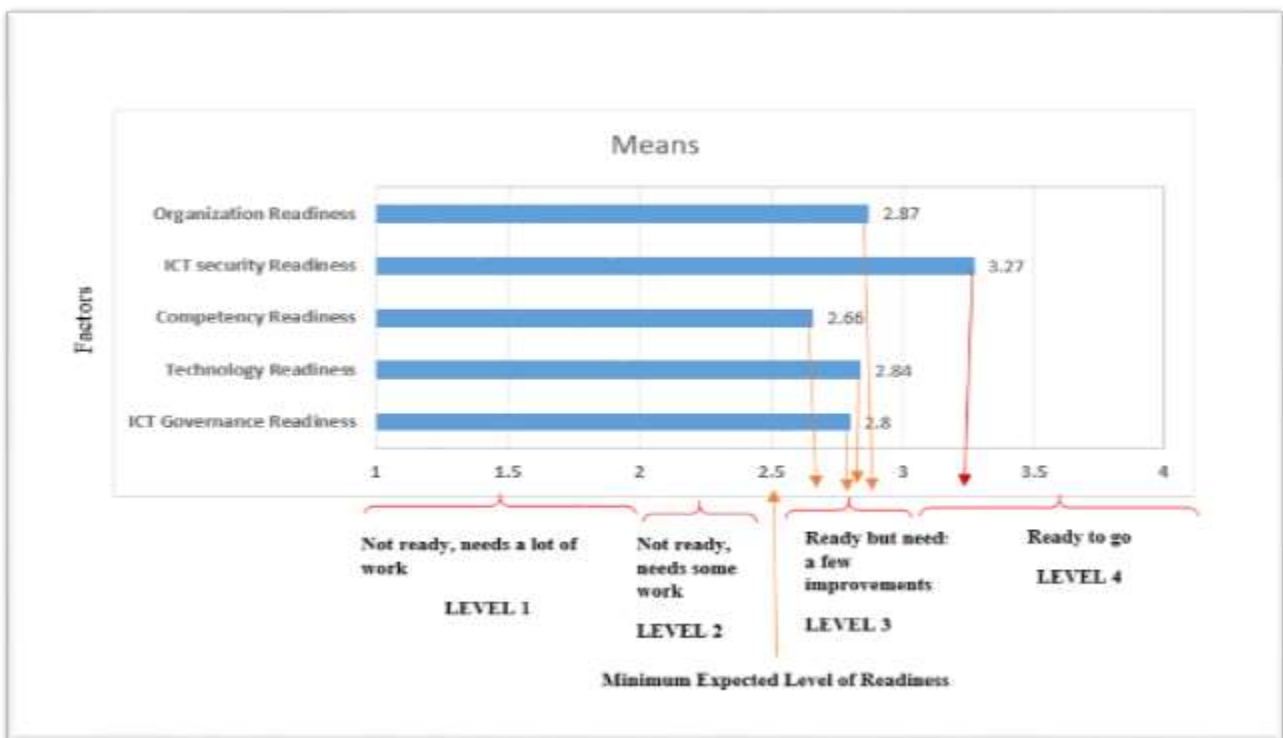
For example on this linear scale,   the ICT governance factor rating is 2.8. This implies that ICT governance is "Ready but needs a few improvements" for undertaking digitization. The competency readiness factor has the lowest average score of 2.66, hence categorized, as "Ready but needs a few improvements". The indicator, which contributed towards low performance of ICT competence is ICT set skills (1.96), showing   inadequacies in this area. From the findings, it is clear that appraisal system in KNEC does not adequately address training needs. The results for ICT security Readiness has a total average of 3.27, categorized, as "ready" but further improvement is required.

4.13   Presentation of Digitization Index Framework

An index, being a statistical aggregate that measures change, should clearly reflect its indicators according to the public service appraisal system. Hence, the study presented a framework for the digitization readiness index of KNEC in a circular fashion. Figure 4.13-1 shows the framework for

the Digitization Index. It is a radial diagram showing clearly the rating of indicators. From the framework, it is easy to see indicators that lag behind; in this case, ICT set skills and determine the ones that are performing well .like data backup.

Figure 4.13-1: Framework for Readiness Level of Indicators

4.14   Analysis of the indicators

In order to present indicators, in a more informative way, the study analyzed them over the Principal Component Analysis (PCA). This is because; PCA can drastically reduce the dimensions of factors in an interpretable way Joliffe and Cadima, (2016).

The results of PCA, Figure 4.14-1, show factors grouped along three components. The study, in an attempt to analyze these factors, categorized them as ether "Most Critical", "Critical" and "less critical "(Supportive) respectively along these groups. Accordingly, indicators grouped under the "most critical" are those whose absence would definitely impede digitization. While those grouped as "Critical" are directly supporting "most critical" factors. The absence of these critical components would definitely compromise effort put in the most critical components. "Supportive" are less critical components and are supportive elements of the "Critical components" of digitization. Hence, these have minimal direct influence towards digitization.

Figure 4.14-1: PCA Analysis of indicator
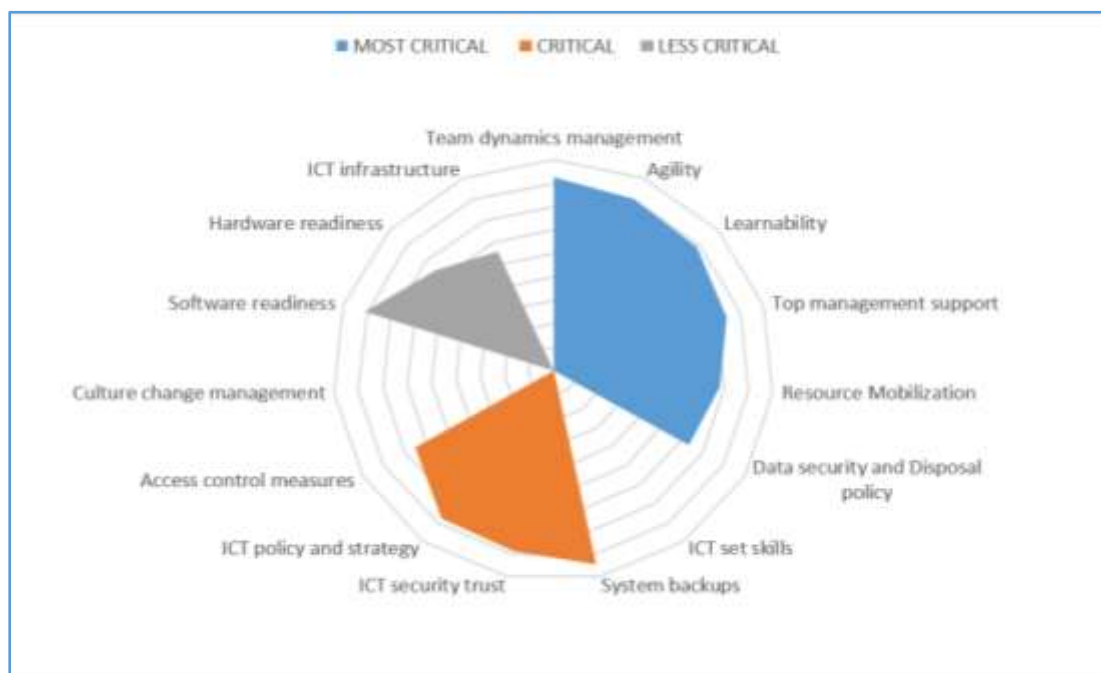
5.0   Discussion of findings, Conclusion and Recommendations

5.1   Introduction

This chapter is the summary of discussions and conclusions drawn from the findings. The study further recommends how organizations should implement the digitization readiness model while at the same time offers insights on areas for further research.

5.2   Discussion of findings

This study developed a framework for digitization readiness based on reviewed literature Al-Omari and Hussein Al-Omari, (2006), aims at assuring successful transitioning from manual documentation to digitized environments for public organizations in Kenya. The importance of digitization findings to KNEC processes is the subject of discussion in this section. As precursor, to this study which summarized overall findings of digitization readiness, assessment and their cumulative indices.

The current study compares favorably with prior studies Gichoya.D, (2005) and Davenport, (2000), where similar success factors for digitization are identified. As an extension to these prior studies, the current study aggregates success factors along three components "most critical", "critical" and "supportive" using PCA. This aggregation improve significantly the understanding of how these factor influence implementation of digitization projects. For instance, the first tier, "most critical", aggregate of factors suggest that if governance, resource planning and capacity development are not enhanced, specifically in public organizations digitization projects are most likely to fail.

Prior studies Davenport, (2000) specify that successful project implementation is achievable with high-level executives having strong commitment to the project. Similarly, Pöppelbuß & Röglinger, (2011) indicates that controls applied to manage activities and actors for software projects, such as tasks assignment and scheduling, lead to successful development. These factors are considered as isolated events. However, this study findings shows that top management support, "most critical", factors cannot lead to successful implementation alone, unless supported by "critical" factors that regulate and reduce risk in digitization projects, such as system backups, ICT security, ICT policy, strategy, and access control. This implies that for digitization projects to succeed there has to be focus on both "most critical" and "critical" factor components simultaneously. Moreover, treating them in isolation would lead to undesirable outcomes, such as data loss and financial misappropriation that may lead to the stalling of digitization projects.

Although Afari-kumah, (2014), indicates that presence of hardware, network, related software, IT support personnel are critical for technology readiness. This study considers them to be "Less critical" for digitization. Although digitization projects require ICT hardware, ICT software and other ICT infrastructure. Most of the hardware and software will not outlive the project. The implication is, organizations may over invest in the technology aspect and later left with unnecessary equipment after the project is completed. This implies that, organizations should consider leasing and hiring of technology equipment's for digitization, especially if they are considering conversion of historical documents to digital format. In addition, this study suggests that at country level, a policy on digitization should be developed to address efficiency of sourcing of hardware and software. Additionally, pooling hardware and software resources across many agencies and their various ministries should be a policy issue to support digitization.

The overall digitization index as calculated shows that KNEC, at 2.88 average score, is ready to undertake successful digitation with minimal adjustments. A critical look however at the individual indices that aggregate this score shows weakness in some of the factors associated with the "most critical" axis. These are competency readiness (ICT skills, Agility, learnability) and Organizational Readiness (top management support, resource mobilization) at 2.66 and 2.87 respectively. The implications of this is that KNEC must prop up these factors to a level of over 3.0 to assure successful implementation of digitization. These indicators, that affect skills development and resource mobilization, require long-term preparation. This may hinder immediate initiation of successful digitization projects. Environmental factors like budgets that take time to be approved, by treasury

may cause delay that may affect digitization readiness index. Therefore, KNEC management need proper planning to make sure all capacities are in place before digitization.

Accordingly, since the most critical indicators are rated lowly in the indices. At this level, KNEC is only able to undertake digitization if it does improvements in the following areas:

KNEC should adequately utilize annual appraisal system and address ICT training needs since results show that, ICT set skills scored lowest. This is in line with the findings of this study that show that training is important for successful digitization. Further collaborated by Hussein Al-Omari (2006) who said that human resource training is important for successful ICT projects. (Vrana, 2011), also established that to successfully perform digitization, employees had to be trained.

On, culture change management KNEC has competent, experienced and aging staff. However, this implies less flexibility to technology change. As stated by Jenny Meyer (2011) who compared employees younger than 30 years, and older workforce and found that older workforce are relatively more negative to technology adoption. This implies that, KNEC management should develop a strategy to handle succession planning in line with digitization. Other compelling factors on culture adjustments include climate change. For example, KNEC should bring on board the culture of greening by developing a policy. Fineman (2002) indicates that greening organization are more environmentally sensitive and are more likely to reap benefits of digitization.

Existing software's in KNEC, from the findings, are considered not flexible enough for digitization. Among issues raised from the study was inadequate training and overly ambitious automation programs, at KNEC, that focus on rolling out many new application software for the different functions. This has led to lack of integration. Therefore, there is need to clearly set standardized development procedure for development of software that address interoperability, redundancy of functionality and optimization of staff productivity to improve digitization at KNEC.

5.3   Conclusion

From the study findings, it can be concluded that digitization readiness assessment model can optimize project resources utilization. From the findings, if an organization undertakes a survey of its digitization priority areas and then use the model to identify its status in these areas. For Digitization projects to succeed, organizations should focus on both "most critical" (Governance issues) and "critical" (control mechanisms) factor components simultaneously. With this, organizations should be able to reallocate both financial and human resources to areas deemed critical yet they lag behind. Towards this, the digitization readiness index is a decision support tool for managers. ICT hardware, ICT software and ICT infrastructure, although important for digitization, management should consider

leasing instead of purchasing. Reason being that after project is over the organization may remain with equipment's that are obsolete in the sense that other ICT projects may not require e.g. scanners.

It is evident that the proposed model offers useful insights geared towards effective government implications to decision makers in the public sector. It equips organizations with a framework that could be applied in performing digitization readiness assessment to identify limitations and provide suitable solutions. Agencies ready to digitize hardcopy documents may refer to this framework as a useful resource during the digitization project. This study empowers organizations with a comprehensive resource pertaining to digitization readiness and provides a comprehensive assessment methodology to guide on self-assessments. While this framework is useful, more research is necessary. The conceptual framework offered in this study paves way for future empirical research to test the framework in a different setups and geographical locations. Nevertheless, this study is an important conceptual step in identifying relevant factors from an organizational perspective for assessing digitization readiness in a public organization.

5.4   Limitations of the study

Due to time and financial resources limitations, this study had to reduce the scope of study. The study for example, did not consider customer views and the legal readiness of KNEC. In order to do this the study would require interacting with a big number of KNEC Customers. Given, that KNEC has many stakeholders who include, more than twenty million people that sat previous exams, schools and ministry of education among others. The study under the current financial and time constraints would not be able to seek views from these stakeholders. Additionally, the stay home orders arising from Covid-19 pandemic made it difficult to have face-to-face interviews with participants. In this study, the weighting of indices did not take into consideration the different categories of components as determined by PCA this may have led to overrating the preparedness level of KNEC

5.5   Recommendations

Several recommendations arising from this study are as follows;

1.   It is import for organization to apply the digitization readiness model, that ranks the readiness factors, to discover areas of priority and should only undertake digitization if the critical factors achieve a minimum level of 3.0. Otherwise, they are likely to have high probability of failure in their projects.

2.   According to the findings, the study recommends sector wide approach to digitization to optimize hardware and software, which are a huge cost. Kenya, for example should

consider a national digitization strategy that allows various agencies that require digitization to pool these resources together.

3. The findings further suggest lack of systems integration may hinder digitization. KNEC therefore should consider outsourcing technological aspects, like cloud computing to support her digitization.

5.6 Further research

1. Future studies should consider a composite scale that encompasses the digitization readiness index and PCA analysis to determine the optimal level of preparedness for an organization.

2. Further research needs to be done to determine influence of customer readiness on digitization readiness

3. Further research needs to be carried out to test the framework in different setups and geographical locations.

References:

1. A.De wit, (1988) "measurement of project success," international journal of project management, vol. 6, pp. 164-170.

2. Adjorlolo, S., & Ellingsen, G. (2013). Readiness Assessment for Implementation of Electronic Patient Record in Ghana: A Case of University of Ghana Hospital. *Journal of Health Informatics in Developing Countries*, *7*(2). Retrieved from https://jhidc.org/index.php/jhidc/article/view/104

3. Afari-Kumah, E., & Tanye, H. A. (2009). Tertiary students' view on information and communications technology usage in Ghana. Journal of Information Technology Impact, 9(2), 81-90.

4. Ahmed Al-Omari and Hussein Al-Omari, (2006)"E-government Readiness Assessment Model", Journal of Computer Science 2 (11): pp841-845

5. Aineruhanga, M .(2004). Focus on the 'Kenya ICT Week'. Chakula Newsletter, (9).

6. Al-Omari,A, Al-Omari,H.(2006) E-Government Readiness Assessment Model Computer Science Department, Applied Science University, Amman, Jordan

7. AlShihi, H.,(2005) "E-government development and adoption dilemma: Oman case study", 6th International We-B (Working for e-Business) Conference, Victoria University, Melbourne, Australia, 2005.

8. Ambler, S. (2008) The "Broken Iron Triangle" Software Development Antipattern, Viewed on 28 April 2009, Available at: http://www.ambysoft.com/essays/brokenTriangle.html.

9. Carr, N. (2004). Does IT matter? Information technology and the corrosion of competitive advantage. Cambridge: Harvard Business School. Available online at http://www.hbsp.harvard.edu.

10. Chanyagorn, P., & Kungwannarongkun, B. (2011). ICT readiness assessment model for public and private organizations in developing country. International journal of information and education technology, 1(2), 99.

11. Chong, S.C., (2006). KM critical success factors. A comparison of perceived importance versus implementation in Malaysian ICT companies. The Learning Organization 13 (3), 230–256.

12. Dudovskiy, J. (2018) the Ultimate Guide to Writing a Dissertation in Business Studies: a Step-by-Step Assistance. Published by research-methodology. Net, 2018

13. Dutta, S., & Mia, I. (2010). The global information technology report 2010–2011. Geneva, Switzerland: World Economic Forum

14. Dzhusupova, Z., Shareef, M., Ojo, A., & Janowski, T. (2010). Methodology for E-Government Readiness Assessment: Models, Instruments and Implementation.

15. El-Darwiche B et al (2013) Digitization for economic growth and job creation—regional and industry perspectives. Booz & Company, New York, US

16. Emam K. el and Koru A. G.,(2008) " a replicated survey of it software project failures," IEEE software, vol. 25, no. 5, pp. 84–90, 2008.

17. Gall, M.D., Gall, J.P., & Borg, W.R. (2007), Educational research: An introduction (8th ed.). Boston: Pearson.

18. Gichoya, D.(2005) "Factors Affecting the Successful Implementation of ICT Projects in Government" The Electronic Journal of e-Government 3(4)175-184.

19. Granito,F.(2018) Digital transformation .available online at https://www.institutefordigitaltransformation.org/institute-fellows/frank-granito/

20. H. Hu, Y. Wen, T.-S. Chua, and X. Li, ''Toward scalable systems for big data analytics: A technology tutorial,'' IEEE Access, vol. 2, pp. 652–687, May 2014..

21. Hakeem,A, et al.(2017) Ecommerce adoption in Developing Countries SMEs:
    4th International Conference on E-commerce, 1820 Sep 2017, Putrajaya, Malaysia.

22. Heeks, R.B. (2006) Implementing and Managing eGovernment: An International Text, Sage Publications, London

23. Hossein,a., and Nematizadeh,f.(2012)an empirical investigation of the level of user's acceptance of e-banking among some customers of banks in Iran (2012) international journal of academic research in business and social sciencesjune2012, vol. 2, no. 6issn: 2222-6990

24. Jolliffe IT, Cadima J. (2016) Principal component analysis: a review and recent developments. Phil. Trans. R. Soc. A 374: 20150202. Available http://dx.doi.org/10.1098/rsta.2015.0202

25. Kariuki, J. Dr. Karugu, N., Okode,M.,(2018) international journal of technology and systems issn 2518-881x (online) vol.3, issue 1, pp 23 - 42, 2018

26. Kashorda, M., & Waema, T. (2014). E-Readiness Survey of Kenyan Universities (2013) Report. Nairobi: Kenya Education Network.

27. Kenney, A. R., & Rieger, O. Y. (2000). *Moving Theory into Practice: Digital Imaging for Libraries and Archives.* CALIFORNIA: Research Libraries Group.

28. Kenya national archives. (2008);(2009);(2010).departmental annual reports. Nairobi. Kenya law reporting. (2008).document imaging partnership proposal. Nairobi

29. Kettani D and Moulin B (2014) E-government for Good Governance in Developing Countries: Empirical Evidence from the EFez Project Anthem Press

30. Khalfan, M. (2001): Benchmarking and readiness assessment for concurrent engineering in construction (BEACON). Loughborough University, Loughborough, UK.

31. Khalfan, M.A., Anumba, C.J., Carrillo, P.M.:(2000) Development of a readiness assessment model for concurrent engineering in construction. Benchmarking: An International Journal 8(3), 223–239 (2001)

32. Koelling, J. (2004), Digital Imaging, AltaMira, Walnut Creek, CA.

33. Kothari, C. R. (2010). Research methodology: methods and techniques. New Delhi: new age international.

34. Lampert, C. K., & Vaughan, J. (2009). Insights into the Cultivation and Sustainability of Academic Library Digitization Programs: Success Factors and Challenge Threats.

35. Lancaster GA, Dodd S, Williamson (2004): Design and analysis of pilot studies: recommendations for good practice. J Eval Clin Pract. 2004, 10: 307-12. 10.1111/j..2002.384.doc.x.

36. Laporta P, Di Tullio JC, Vermeulen E, Domit C, Albuquerque C, Lodi L (2009) Report of the working group on habitat use of Tursiops truncatus in the Southwestern Atlantic Ocean. Lat Am J Aquat Mamm

37. Lavasseur, D. (2010). *Organization structure and Project Management*, (9th Edition).Gower Publishing Ltd.

38. Leng Xha, (2014). Effects of Failure to Supervise Project Activities. *International Journal of Project Management*, vol. 12, pp. 94-106.

39. McKinsey & Co. (2014) Achieving World Class Productivity in the NHS. London: McKinsey & Co.

40. Mcrael, B. (2013). Effects of Managerial Skills in Managing Infrastructure Projects in Europe. Project Management Journal, 39(2), pp. 65-74.

41. Molla, A and Licker, P (2005), 'ecommerce adoption in developing countries: a model and instrument', *Information and Management*, vol. 42, no. 6, pp. 877-899.

42. Mutula, S.M. & van Brakel, P. (2006). An evaluation of e-readiness assessment tools with respect to information access: Towards an integrated information rich tool. International Journal of Information Management, 26, 212-223.

43. Namande,(2010) "Digitization of Archival Records: The Kenya National Archives and Documentation Service Experience," Second International Conference on African Digital Libraries and Archives (ICADLA-2)

44. Nasser, A. et al. (2007) "Assessing e-Readiness in the Arab Countries: Perceptions Towards ICT Environment in Public Organizations in the State of Kuwait" The Electronic Journal of e-Government Volume 5 Issue

45. Ochieng' C. Oguk, (2016) Network Security Metrics for Improving Network Security Management

46. Ouma, E., et al (2013) 4 th International Conference of the African Association of Agricultural Economists held in September 2013 in Hammamet, Tunisia on Commercialising Agriculture in Africa: Social, Economic and Environmental Impacts. Conference proceedings.

47. Ouma, G. O., Awuor, F. M., Kyambo, B. (2013). E-Learning readiness in public secondary schools in Keny. European Journal of Open, Distance, and e Learning, 16(2), 97-110.

48. Oztemel, E &Korkusuz,T., Oztemel, E. & Polat, T.K. (2006). Technology Readiness Model for Enterprises. In: Pham D.T., Eldukhri, E.E. & Soroka, A.J. (Eds.), Intelligent Production Machines and Systems (pp. 362-367). Elsevier Science Ltd.

49. Pöppelbuß, J. and Röglinger, M. (2011), what makes a useful maturity model? A framework of general design principles for maturity models and its demonstration in business process management. 19th European Conference on Information Systems (ECIS 2011). Helsinki, Finland.

50. Provost, F., Martens,D. , Alan Murray,A.,(2015) finding similar mobile consumers with a privacy-friendly geosocial design, information systems research, v.26 n.2, p.243-265, June 2015

51. R. Amit and C. Zott (2001)., "Value creation in E-business," Strategic Manage. J., vol. 22, pp. 493-520,

52. R. Atkinson, (1999)"project management: cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria," int' journal of project management, vol. 17, pp. 337-342,

53. Rafiq, m., & Ameen, k. (2013). Digitization in university libraries of Pakistan. Department of Library & Information Science, University of the Punjab, Lahore, Pakistan

54. Rizk , E.A. (2004)Studies on Enrichment of Bread. Msc.Thesis , Food Industry Dept. , Mansoura Univ. , Egypt.

55. Ryoo, et al., (2009) Security education using Second Life. IEEE Security Privacy Magazine 7(2), 71–74

56. Saima Khan, Shaziz Khan, Mohsina Aftab.(2015).Digitization and its Impact on Economy. International Journal of Digital Library Services. June, 2015; 5(2), 138-149.

57. Sánchez, M. (2017). A Framework to Assess Organizational Readiness for the Digital Transformation. Dimensión Empresarial, 15(2), 27-40.

58. Sigauke, D. T. and Nengomasha, C. T. (2011). Challenges and prospects for the digitization of historical records at the National Archives of Zimbabwe. Paper presented at the 2nd International Conference on African Digital Libraries held at the University of Witwatersrand, Johannesburg, South Africa 14th -18th November 2011.

59. Smith, Abby, (1999); why digitize? Council on library resources, Inc., Washington, dc. Council on library and information resources, Washington, dc. isbn-1-887334-65-3

60. Subiyakto, A. and Ahlan A. R., (2013) "An alternative method for determining CSFs of ICT project environment," 2013, Manuscript is submitted for publication.

61. Teo, S.L.H. (1999). Movement and Population Dynamics of the Mummichog, Fundulus heteroclitus, in a Restored Salt Marsh. Masters Thesis, Rutgers University, New Brunswick, NJ.

62. Tharani, K. (2012). Collections Digitization Framework: A Service-oriented Approach to Digitization in Academic Libraries. Partnership: The Canadian Journal of Library and Information Practice and Research 7(2) 1-13.

63. Tjan, A. (2001). Finally, a way to put your internet portfolio in order. *Harvard Business Review, Vol 79 No. 2*, 76-85.

64. Tomomi Kameda, (2012).Department of human health science and congenital anormaly research centre,Kyoto university graduate school of medicine .kyoto, japan

65. Vrana, R. (2011). Organizational aspects of digitization projects in the Croatian public libraries. *Library Management, Vol. 32 Iss: 8/9,*, 589 - 598.

66. Wausi,A.,Waema,T.(2010), Implementing IS in Developing A Developing Country: HE Context: Towards Creating A Favorable Implementation Context .

67. Yakel (2004)and Torres, "AI: Archival Intelligence"; Carol Kuhlthau, "Developing a Model of the Library Search Process: Cognitive and Affective Aspects," Reference Quarterly 28, no. 2 (1988): 232–42.

68. Yakout, M., Adly, N., Nagi, M.: Digitization Workflow Management System for Massive Digitization Projects. In: 2nd International Conference on Universal Digital Library ICUDL 2006, Alexandria, Egypt (November 2006)

APPENDICES
Appendix I: Research Permit by university of Nairobi to carry out research.

UNIVERSITY OF NAIROBI
COLLEGE OF BIOLOGICAL AND PHYSICAL SCIENCES
SCHOOL OF COMPUTING AND INFORMATICS

Telephone:	4447870/4446543/4444919	P. O. Box 30197
Telegrams:	"Varsity" Nairobi	00100 GPO
Telefax:	+254-20-4447870	Nairobi, Kenya
Email:	director-sci@uonbi.ac.ke	

19th February 2020

Our Ref: UON/CBPS/SCI/ MSC/ITM/2017

Kenya National Examination Council
P.O. box 735598-002000
Nairobi
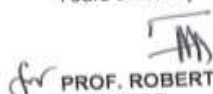
Dear Sir/Madam

RE: RESEARCH PERMIT – LEAH WANGARI KIRATU REG. NO. P54/6451/2017

The above named is a bona fide student pursuing an MSc course in Information Technology Management at the School of Computing and Informatics, University of Nairobi. She is currently carrying out her research on the project entitled *"Assessment of digitization Readiness of an Organization (A Case Study of Kenya, National Examinations Council)"*. The project involves gathering relevant information from various institutions and she has informed the office that she would wish to carry her research in your organization and is under supervision of Dr. S.N. Ruhiu.

We would be grateful if you could assist Ms. Kiratu as she gathers data for her research. If you have any queries about the exercise please do not hesitate to contact us.

Yours sincerely

School of Computing & Informatics
University of NAIROBI
P. O. Box 30197
NAIROBI

PROF. ROBERT O. OBOKO
DIRECTOR
SCHOOL OF COMPUTING AND INFORMATICS

Appendix II: Letter of request for data collection at KNEC

THE KENYA NATIONAL EXAMINATIONS COUNCIL

Internal Memo

To : Ag Chief Executive Officer

Through : Director ICT

From : Leah Kiratu

Date : 14th May 2019

Forwarded & Recommended.
Afu 15/05/2019

Subject : **REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN KNEC**

I am a student at The University of Nairobi (UoN), studying Master of Science in Information Technology Management. It is a requirement of the university that all students must carry out research projects in partial fulfilment of the degree's requirements.

I am therefore kindly seeking for permission to carry out research in KNEC on the **Investigation on digitization readiness for converting results hardcopy documents into digital records".** This study will evaluate whether KNEC is prepared to carry out digitization project for the old results documents held in Archive section. This project will be conducted under the supervision of Dr. Ruhiu (UoN Chiromo Campus).

Upon completion of the study, I will provide KNEC with a bound copy of the full research report. Your approval to conduct this study will be greatly appreciated.

Leah Kiratu
14/5/2019

ICT OFFICER II –ICT DEPARTMENT

To S, so The officer can be allowed to proceed with the study but needs to be informed of the requirements for use of KNEC data

16/5/19

KENYA NATIONAL EXAMINATIONS COUNCIL
RECEIVED
1 6 MAY 2019
TIME: 5.48
RESEARCH & QUALITY ASSURANCE

OFFICE OF THE SECRETARY
15 MAY 2019
NAIROBI
EXECUTIVE - K.N.E.C.

108

Appendix III Questionnaire for the Respondents

SECTION A:

PERSONAL INFORMATION

A1.firstName   LastName   (Optional)

_____

A2. Select your department at KNEC

A3.   EA/EM [____]   ICT [____]   TD [____]   CEO's Office [____]

What is

your

current Job Title? _____

A4.Please indicate your current EC Grade bracket from the list: ☐

1-4 [____]   5-8 [____]   9-12 [____]   13-16 [____]

A5. Kindly indicate your Gender:

Male [____]   Female [____]   Transgender [____]

A6. Please choose the best description of your age bracket:

☐Below20 years   ☐20–24 years   ☐25–29 years   ☐30–34 years

☐35–39 years   ☐40–50 years   ☐Above 50 years

A6. Indicate your highest education attained:

☐ High school   ☐ Diploma   ☐ Bachelor's   ☐ Master's   ☐ PhD
                                              degree   Degree

A7. Please indicate which bracket best describes the numbers of years you have worked at KNEC:

☐ below 1 year   ☐1–5 years   ☐5–15 years   ☐above 15 years

A8. Do you have any ICT skills?

Yes   [____]   No   [____]

A9. Has KNEC allocated you a computer?

Yes ☐   No ☐

If yes to question A9, then answer A10

A10. Indicate how often, over the last one year, you used the allocated computer to do the following KNEC related work:

A10.1	Checking email /sending emails	☐Every Day ☐Once A Week ☐ Once A Month ☐ Once A Year ☐ Not At All
A10.2	Serving clients (solving queries, confirming results, issuing certificates and slips)	☐Every Day ☐Once A Week ☐ Once A Month ☐ Once A Year ☐ Not At All
A10.3	Doing KNEC Core duties	☐Every Day ☐Once A Week ☐ Once A Month ☐ Once A Year ☐ Not At All
A10.4	Accessing social media (Facebook, Twitter, WhatsApp, YouTube)	☐Every Day ☐Once A Week ☐ Once A Month ☐ Once A Year ☐ Not At All

A11. Any other usage, please describe…………………………………………………………

SECTION-B; ICT GOVERNANCE

ICT POLICY

Kenya National Examination Council (KNEC) controls the usage of mobile phones when handling examinations, access, and sharing of sensitive information to unauthorized personnel among others. All these are part of controls put in place as part of KNEC ICT policy. The following questions seek to identify the level of awareness, knowledge, and usage of the same. And the extent to which ICT policy can influence digitization readiness

Kindly respond to each question as is appropriate.

B1) Are you aware of the KNEC ICT policy?   Yes ☐ No. ☐

If your answer to question B1 is yes, then respond to questions B2 and B3.

B2) which of the following best represents how you learned about the ICT policy:

(Please tick ✓ the options that can represent your situation)

110

B2.1	Through reading a hard copy	
B2.2	By reading copy sent via email	
B2.3	By downloading from the KNEC website.	
B2.4	Through training workshop/briefing and sensitization organized by KNEC	
B2.5	From a colleague.	

B3) Kindly select the option that best represents how you referred to KNEC ICT policy for the last one year:

(*Please tick ✓ the options that can represent your situation*)

B3.1	Every week	
B3.2	Every month	
B3.3	At least once in every three months	
B3.4	At least once in six months	
B3.5	Never used it at all	

B4) in your opinion, which of the following best describes how ICT policy impacts KNEC: (*Please tick ✓ the options that represent your situation)*

B4.1	ICT Policy is of no importance to most of the examination processes	
B4.2	ICT policy is of little Importance since few processes require reference to it.	
B4.3	I am not Sure	
B4.4	ICT policy is important since a good number of examination processes require reference to it.	
B4.5	ICT policy is Very Important since most of the examination processes require reference to it	

B5 TEAM DYNAMICS MANAGEMENT

This section measures elements that contribute to team dynamics in KNEC projects. You are requested to assess the statements and reflect on the general working relations among the team members. Hence evaluate each question on a scale 1-5

Use the scale of 5 – 1 where: -5strongly agree 4- agree 3- Not Sure 2- Disagree 1-strongly disagree.

(*Please tick ✓ the options that can represent your opinion)*

Team Coordination and Management

No.	Description	Measurement				
		1	2	3	4	5
B5.1	In all projects, teams members have clear roles, objectives, and responsibilities					
B5.2	Team members generally discuss and agree on the working procedure.					
B5.3	There is a high degree of collaboration among team members					
B5.5	Team members respect and adhere to clear working standards					
B5.6	The atmosphere in teams is always positive and friendly					

COMMENTS……………………………………………………………………………………………………
……….

Culture Change Management

Use the scale of 5 – 1 where: -5strongly agree 4- agree 3- Not Sure 2- Disagree 1-strongly disagree

No.	Description	Measurement				
		1	**2**	**3**	**4**	**5**
B6.1	I enjoy using ICT to solve clients problems					
B6.2	I always look forward to using new ICT applications					
B6.3	I enjoy working with manual records.					
B6.4	Information Technology generally improves my work					
B6.5	I, generally, fear the use of ICT to do work					
B6.6	I feel that by using ICT my supervisor will be happy with my work					

B6.8

Comment………………………………………………………………………………………………………
……
……
…………………………………………………………………………………………………….

SECTION C:

TECHNOLOGY READINESS

This section evaluates the relative progress of an organization towards realizing the internal capacity to carry out a digitization project. It tests the extent of preparedness in house and outsourcing capacities of an organization. Evaluate the facts on a scale of 1 – 5.

 Use the scale of 5 – 1 where: -5strongly agree 4- agree 3- Not Sure 2- Disagree 1-strongly disagree

ICT hardware Readiness

No.	Description	Measurement				
		1	**2**	**3**	**4**	**5**
C1.1	If KNEC were to undertake digitization, today, it has sufficient ICT hardware in terms of printers, computers, and scanners that can enable successful digitization of all hard copy documents					
C1.2	The ICT staffs are capable, to the highest degree, of generating correct specifications for any additional hardware required towards digitization.					
C1.3	KNEC has, to the highest degree, sufficient capacity to store all her data on external and internal servers					

C1.4 Comment………………………………………………………………………………

Software and Information System Readiness

No.	Description	Measurement				
		1	2	3	4	5
C2.1	If KNEC were to undertake digitization, today, it has sufficient existing computer software applications that can enable successful digitization of her records.					

No.	Description	1	2	3	4	5
C2.2	KNEC staffs are capable, to the highest degree, of generating correct specifications for any additional software that is required towards digitization.					
C2.3	The existing software is highly documented making it easy to modify and accommodate new changes where necessary.					
C2.4	Existing training programs on new application areas are adequate to enable ease of use for the software.					
C2.5	Existing support for software applications is very good; we always get our problems solved in less than 24 hours.					

C2.6 Please comment…………………………………………………………………

ICT Infrastructure

No.	Description	Measurement				
		1	2	3	4	5
C3.1	The existing fixed phones in our offices sufficiently meet communication needs.					
C3.2	All offices are equipped with fast internet accessed on computers					
C3.3	KNEC is always willing to increase internet bandwidth Whenever complaints are raised over slow speed					

SECTION D) Competency Readiness

 ICT set skills

This Section measures the skill set required to undertake digitization. Please indicate your ICT professional area of interest that is enabling you to perform an ICT related task.

D1) please rate your abilities in the metrics below, (tick appropriately)

Use the scale of 5 – 1 where: -5strongly agree 4- agree 3- Not Sure 2- Disagree 1-strongly disagree

S/NO	QUESTIONS	1	2	3	4	5

114

D1.1	KNEC, regularly, offers training and seminars on ICT related courses for skills upgrade.				
D1.2	If identified to participate in digitization, I have Relevant technical skills required.				
D1.3	Most employees, in KNEC, work independently without the need for supervision.				

D2 From the list, below, select the competences you poses that can support digitization at KNEC *:(you can select more than one option)*

No.	Area of specialization	
D2.1	Supervisory skills	
D2.2	Project management skills	
D2.3	Problem formulation skills	
D2.4	Systems implementation	
D2.5	Network Installation	
D2.6	Systems Specification	
D2.7	System Support	

D3. The annual appraisal system adequately addresses my ICT training needs

Not at all	To a small extent	Not Sure	To a large extent	To a very large extent

Learnability

D4. Please select the appropriate option to indicate the last time you upgraded your skills in ICT.
(*this may include seminars and short term training lasting more than 3days)*

None	Less than six months ago	One year ago	Two years ago	Three years ago

D5 Briefly describe the training attended ………………………….

D6

Describe the extent to which the training was relevant to your job	Irrelevant	Somehow Relevant	Not Sure	Relevant	Very Relevant	D7)

Please indicate, among the following options, which is your preferred mode of learning:

No.	Description	Tick one choice
D7.1	Reading a book	
D7.2	Reading online learning	
D7.3	Practice a concept with a colleague	
D7.4	Taking a formal class	
D7.5	Attending a workshop or seminar	

D7.6 comments …………………………………………………………..

Agility

D8.This section explores how employees can adjust their roles due to work-related pressure and the effect on digitization. Using a scale, of 1 – 5 where: 5-strongly agree 4- agree 3- Not Sure 2- disagree 1-strongly disagree.

Evaluate the facts below.

No.	Description	Measurement				
		1	2	3	4	5
D8.1	To the highest degree, I am always certain of what work is required of me every day					
D8.2	To the highest degree, I conclude tasks allocated to me every day.					
D8.3	I am sure, to the highest degree that by digitizing all hard copy documents my daily work will be easier.					
D8.4	During the course of my work, I always encounter scenarios where I am required to learn new knowledge to perform a task.					

SECTION E: ICT SECURITY

This section deals with the security of ICT and evaluates progress made in securing information assets.

This questionnaire would assess the influence of digitization readiness. Using a scale of 1 – 5 where:

5-strongly agree 4- agree 3- Not Sure 2- disagree 1-strongly disagree evaluate the following facts.

Data Security and Disposal/Policy

E1) Are you aware of the KNEC **Data Security and Disposal/Policy**?

    Yes ☐   No. ☐

If your answer to question E1 is yes, then respond to questions E2.

E2. The following questions seek to identify your level of awareness, knowledge, and usage of the KNEC ICT security policy.

No.	Description	Measurement				
		1	2	3	4	5
E2.1	To the highest degree, the KNEC security policy is written in a way that can be understood by the majority of staff.					
E2.2	Training employees on the security of data is critical for their work performance in KNEC.					
E2.3	If the existing security policy were to be reviewed we shall minimize threats and risks to data.					
E2.4	Dedicating an office to manage information and data security assures that these assets are secure					
E2.5	I consider training in data and information security as important to the digitization process in KNEC.					

Access Control
Access controls are the measures put in place to authenticate and authorize individuals to access systems for effective data protection.

E3) Kindly respond to each question as appropriate as possible. Use the scale of 1 – 5 where:

Use the scale of 5 – 1 where: -5strongly agree 4- agree 3- Not Sure 2- Disagree 1-strongly disagree

No	Description	1	2	3	4	5
E3.1	Restricting unauthorized personnel to the data center can add value to digitization project.					
E3.2	CCTV civilian monitoring of external access and internal access points to the ICT server room clearly encourages digitization.					
E3.3	Additional access controls like the use of biometric put in place in segregated Examination processing areas (ICT offices, Exam processing rooms, exam printing rooms, test development, and manuscript) improves the credibility of digitized records.					
E3.4	Use of firewall protects KNEC Intranet against Spam mail and Internet spyware that creates confidence in digitized data.					
E3.5	All networked computers in KNEC are protected using a licensed annually updated anti-virus software that controls data loss.					

Security trust

E4) Kindly respond to each question as appropriate as possible. Use the scale of 1 – 5 where:

Use the scale of 5 – 1 where: -5strongly agree 4- agree 3- Not Sure 2- Disagree 1-strongly disagree

No	Description	1	2	3	4	5
E4.1	I believe strengthening of password improves the security of data.					

E4.2	If Systems are Secure this will improve trust in digitization.					
E4.3	I believe transaction data transferred over the Internet is securely protected.					
E4.4	KNEC information systems are prone to hacking.					

System Backup

System backup ensures that services are available in the event of a system failure.in this questionnaire, the study will measure the frequency of backups, location storage of backed up data and Protection of backup media whilst on-site, off-site (secure fireproof safe) and in transit.

E5) Do you back up your data?

Yes [ ]   No [ ]

If yes to question F4 answer question F5 and F6

E6) how often do you back-up data on the servers?

E6.1	Daily,	
E6.2	Weekly,	
E6.3	Monthly backups	
E6.4	Yearly	
E6.5	Never	

E7 Do you verify your data after backing up to make sure that it is working?

Yes [ ]   No [ ]

E8 Kindly respond to each question as appropriate as possible. Use the scale of 1 – 5 where

Use the scale of 5 – 1 where: -5strongly agree 4- agree 3- Not Sure 2- Disagree 1-strongly disagree

No	Description	1	2	3	4	5
E8.1	To the highest degree, once KNEC data is digitized it will become easy to backup and store					
E8.2	Data Backup is very important for any digitized data to control data loss in case of system failure.					
E8.3	Verification of backed up data is important to ascertain that the data is safe and complete.					
E8.4	Backing up data in an off-site location enhances digital security and helps in business continuity in case of disaster.					
E8.5	Protection of backup media whilst on-site, off-site (secure fireproof safe) and in transit will create confidence in digitization readiness					

E9; comments--

SECTION F; ORGANIZATION READINESS

A project readiness assessment is a pre-project review to evaluate the organization's overall readiness to begin a project, identity areas needing more attention, and make recommendations that significantly increase the likelihood of project success. Items to assess include the following. Top management support and resource mobilization.

Top Management support

F1 To what extent do you concur with the following statements concerning the influence of management support on the implementation of digitization projects in KNEC?

Use the scale of 5 – 1 where: -5strongly agree 4- agree 3- Not Sure 2- Disagree 1-strongly disagree

No	Description	1	2	3	4	5
F1.1	If Management helps in designing standards in KNEC showing project goals and guidelines of the digitization project, this will improve reduce cost and time to undertake the project.					
F1.2	If Management helps in delegating and utilizing roles concerning personnel within KNEC from set structures this will motivate staff making digitization a success.					

F1.3	Having a contingency plan developed by Management will help in managing risks involved in projects which will increase the success probability of digitization.					
F1.4	If Management at KNEC monitors and evaluates project progress and utilizes the available resources, implementation of the digitization project will be smooth and successful.					
F1.6	If Management helps in building and sustaining proper communication between project team members it will be easy to coordinate and complete the project on time.					

PROJECT RESOURCE MOBILIZATION

F2 To what extent do you believe that the statements below influence digitization readiness in KNEC? Please tick () the appropriate answer

Use the scale of 5 – 1 where: -5strongly agree 4- agree 3- Not Sure 2- Disagree 1-strongly disagree

No	Description	1	2	3	4	5
F2.1	If KNEC provides financial resources, the digitization project will be implemented successfully.					
F2.2	using the current trained ICT staff, KNEC is ready to carry out digitization project successful					
F2.3	If KNEC Mobilizes technical equipment required for digitization projects it will be easy to implement digitization.					

Section H: Digitization readiness factors

H2) According to your opinion, what do you think are the most critical factors for successful ICT implementation? 1-5

5: Most Critical

4: Critical

3: Not sure

2: less critical

1: Not critical

H2.1	ICT governance	
H2.2	Technology Readiness	
H2.3	Competency Readiness	
H2.4	ICT security	
H2.5	Organization Readiness	

H3) what other factors do you think should be considered to make digitization implementation success in KNEC? If so, list the factors and describe why you see them relevant.

H4) Ranking the significance of the indicators considered in the study.

How significant do you think the following factors are, in determining the preparedness in carrying out a digitization project? Insert the applicable score out of 5 with 5 being very significant and 1 being Very insignificant.

Very significant (5)	significant (4)	Not sure(3)	Less significant (2)	Not significant (1)	
H4.1		ICT Policy implementation			

H4.2	Team Coordination and Management	
H4.3	Culture Change Management	
H4.4	ICT Hardware E-Readiness	
H4.5	Software and Information System Readiness	
H4.6	ICT Infrastructure	
H4.7	Service and Support	
H4.8	ICT Set Skills	
H4.9	Agility	
H4.10	Access Control	
H4.11	Data Security and Disposal/Policy	
H4.12	System Backup	
H4.13	Top Management Support	
H4.14	Project Resource Mobilization	

END