CHALLENGES AND STRATEGIES IN DIGITIZATION PROJECTS IN THE KENYAN GOVERNMENT

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DECLARATION

This research project is my original work and has not been submitted for a degree in any other University.

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This Research project has been submitted for examination with my approval as university supervisor

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DEDICATION

This work is dedicated to my dear husband Nemwel, and all my children Glenna, Gloria and Gabriel whose love, support and understanding made it possible for me to complete it. To my mother Janepher and sisters. You have always been a source of inspiration.

ABSTRACT

The world has experienced rapid growth in the information and communication technology (ICT) sector, resulting in major transformation in social, economic and business operations and processes. The ICT sector has helped to reduce the cost of communication, increase market information and facilitate doing business. This has brought the need for governments and businesses to digitize their practices and processes. The purpose of the study was to establish the practices, challenges and strategies in digitization in the Kenyan Government. The objectives of this study were to: establish the practices involved in the digitization projects undertaken by departments in the Kenyan Government; determine the challenges that are faced in digitization in the Kenyan Government; and determine strategies that can be applied for successful digitization in the Kenyan Government. This study used descriptive survey design. In this case the target population was all ministries. Judgmental sampling was used to select 38 government departments. The research instrument was a questionnaire which was administered using "drop and pick later" method. One subject from each department was selected to respond to the questionnaire. Data was analyzed through percentages, frequencies, mean scores, standard deviation and factor analysis. The presentation of findings from quantitative data was by use of tables. Study findings revealed that digitization in government follow some of the best practices in digitization. These include quality assurance and quality control of metadata, content preservation, specifying the need for creating the digital collection and quality review of digital copies. Digitization is challenged by many factors including financial constraints, inadequate personnel in the projects, poor handling of original documents and material and inadequate resources and infrastructure for digitization. Technical know-how of project staff and procurement procedures are other challenges which hinder effective digitization in government. Study findings also revealed that various departments in Kenya undertaking digitization projects have devised strategies which have enabled them to cope with some of the challenges faced. Some of the workable strategies include documenting standards and best practices to be applied uniformly and planning, monitoring and effective budgeting in the project. Other strategies usually applied include having digital and quality standards and policy enactment before digitization starts. The following recommendations were made. First, the government departments should ensure that proper planning and budgeting is done even before the project starts. Secondly, every department engaged in digitization should ensure a consistent, high level of image quality across collections. Lastly, all digitization projects in government should decrease the likelihood of re-digitizing in the future by promoting best practices for conversion of materials into digital format and the long-term preservation of these digital resources.

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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The world has experienced rapid growth in the information and communication technology (ICT) sector, resulting in major transformation in social, economic and business operations and processes (Rafiq and Ameen, 2013). The ICT sector has helped to reduce the cost of communication, increase market information and facilitate doing business. This has brought the need for governments and businesses to digitize their practices and processes.

Digitization is the process of taking traditional record materials, typically in the form of papers, and converting them to electronic form where they can be stored and manipulated by a computer (Witten and Bainbridge, 2003). Governments over the world continue to seek ways to provide convenient and reliable government information and services by digitizing records and historical information. As our world becomes increasingly digital, governments and municipalities started digitalization projects to make their holdings available to their users and to develop new government and municipal services based on digital information material. Digitization in government is used as a reformatting method for paper-based government materials (Arthur et al, 2004).

Digitization in government is usually initiated for two major reasons: increased access to government records and preservation of government material. Manzuch (2009) indicated that digitization is a powerful way to expand access to the collections that enables their wide use for service provision, research, education, leisure, tourism and other purposes. In many cases digitization assists in preservation of originals or

becomes the only method to safeguard fragile materials (e.g. newspapers, audiovisual resources) for future generations.

Digitization allows preservation of rare, fragile, and unique materials (Lopatin, 2006). Preservation is very important as information is produced and encountered by individuals and institutions in escalating volumes (Beagrie, 2006), and it is likely that part of information will be permanently lost due to lack of care. For Lorie (2001), archived materials (books, newspapers, scientific papers, government and corporate documents, etc) are in danger of becoming unreadable. To prevent deterioration and loss of government records, governments have chosen digitization as an additional method for reformatting endangered and fragile paper-based materials to both preserve and provide increased access to government collections (Arthur et al, 2004).

1.1.1. Digitization Practices

Best practices in digitization project are a practical guide on how to implement a digitization project. According to Sabbagh et al (2012), creating a digital collection involves the following steps: planning, implementation and promotion. These are essential if the finished product is to successfully meet the user's needs and conform to the accepted quality standards. Planning mainly involves identifying various tasks related to creating a digital collection, developing strategies for handling these tasks, identifying required resources and formulating a timeline for accomplishing these tasks.

While digitization seems appealing to many government institutions, those among them which undertake digitization face many organizational and management

challenges. For Roush (2005), digitization is no small challenge: scanning the pages of brittle old records at high speed without damaging them is a problem that's still being addressed, as is the question of how to store and preserve their content once it's in digital form. This would call for any digital information systems to store and manage the digital records. By launching a digitization project, every institution or department is confronted with a question of cost.

1.1.2 Digitization Challenges

Smith (1999) pointed out that the various challenges in digitization include cost of conversion, institutional commitment to keeping those converted materials refreshed and accessible for the long-term and lack of facilities or infrastructure. Other challenges in digitization include copyright issues, lack of technical expertise / inadequate staffing, lack of high level management support and lack of understanding of the importance of the digitization concept. Dahl et al (2006) also observed that proper funding of the digitization project is another challenge facing many projects. Other challenges revealed by Roush (2005) include poor sensitization to users, fast changing technology making content have very short life cycles, poor planning, lack of digital standards and poor psychological preparation of the employees. Liu (2004) also observed that many digitization projects are affected by poor promotion and access to the digital content, lack of technical know how on the part of employees and the digitized content having low user friendliness.

1.1. 3 Digitization Strategies

Digitization projects requires a good technological infrastructure: web servers, application platforms and software applications, network services, relational database

management systems (Dahl et al, 2006) and other forms of technological support necessary for development of digital collections. Liu (2004) indicated that to achieve success, digitization projects must have support of institutional infrastructure, which is required for the long-term projects of development of digital collections and digital repositories. This infrastructure includes: policy development, technology, funding, expertise, and long-term commitment of institution (Yakel, 2004). Digitization of government records, processes and institutions also helps in opening a promising role for these institutions and will raise new issues and increase the profile of government and public servants.

1.1.4 Digitization in the Kenyan Government

The government of Kenya is digitizing government records to increase transparency and government accountability. Various government institutions are turning their records into digital format. Among them is the Judiciary, Civil Registration, Hospitals, land registry, legal documents and libraries. The government is digitizing judicial records and land deeds, as well as the government procurement process, in an effort to increase transparency and eliminate opportunities for corruption. The Judiciary Digitization started in 2011. The project is aimed at digitizing over 30 million records in the registries as a first step towards the automation of the justice system in Kenya. So far 2.5 million records have been digitized. The work entails the conversion of the current paper documents into digital formats and storing them in a centralized document management system.

The government is also digitizing material at the National Civil Registration comprising birth and death records after which state departments will be required to digitize theirs to complete the e-government exercise (Mwirigi and Kinyanjui, 2012).

This is a part of efforts to offer government services electronically, commonly referred to as e-government. Access to government services had in the past been slow, mainly blamed on the manual system of operation.

Another digitization was in lands ministry. In 2009, a land information management system was implemented in Kenya's Ministry of Lands. The education sector is also being digitized. To help in developing relevant local content for the education sector, the Communications Commission of Kenya (CCK) partnered with the Kenya Institute of Education (KIE) in 2008 in its programme for digitization of the Kenya Certificate of Secondary Education (KCSE) curriculum.

Kenya is tackling regional disparity by setting up digital centres countrywide. In 2010, the ICT Board launched Tandaa local digital content grants to support entrepreneurs in developing local digital content. Another development that is within the country's E-government initiative is the State Law Office Company registry's digitization exercise which resulted in the transformation of 25.5 Million paper records to digital format in May, 2010 (Mwirigi and Kinyanjui, 2012). Further, Google's ongoing global effort to bring historical and cultural heritage online has incorporated Kenya's initiative called Open Access to Public Legal Information into its programme.

However, there have been reported challenges in digitization efforts. One of the challenges is lack of common standards or guidelines that would allow easy citizen access to the information using current and emerging technologies (Amollo, 2011).

Though Article 35 of the Constitution of Kenya 2010 establishes the citizen's right of access to public information, actual access remains limited.

To tackle some of these challenges, Kenya's standardization body, the Kenya Bureau of Standards (KEBS) have intervened to solve the standardization problem by establishing a Technical Committee to help set standards for digitization of libraries, record centers and archives. The ISO TC46 SC11 committee was established to develop standards in archives/records management which covers standardization of principles for the creation and management of documents, records and archives as evidence of transactions and covering all media including digital multimedia and paper, archives and records management (Amollo, 2011). Despite the zeal with which the government is supporting and implementing these ICT related changes, the pace in digitization of libraries and national records offices or departments still remains generally slow.

There is need for more action to ensure that libraries and national records are incorporated in the national digitization policies and plans and implemented efficiently. This study sought to establish the practices, challenges and recommend measures required to deal with digitization projects to make them a success.

1.2 Statement of the Problem

The digitization of government information ensures improvement in processes within government agencies (Ray, 2004). This results in increased efficiency and better management and delivery of public services. Several studies have been done relating to digitization. A study by Arthur et al (2004) revealed that digitization offers many

benefits including increased accessibility; increased functionality; output capability to other media; systematic and purposeful collaboration; identification and selection of materials. This study however was done in Canada and the context could have been different from Kenya.

For effective digitization, best practices need to be adopted to ensure that the process is a success. Best practice equates to any procedure which, when properly applied, consistently yields superior results, and is therefore used as a reference point in evaluating the effectiveness of alternative methods of accomplishing the same task. A study by Yan (2004) investigated the best practices, standards and techniques for digitizing materials in Florida State in USA. The study established that different state departments had adopted their own policies with regard to digitization. A study by Katz et al (2013) in Latin America established that standards and guidelines associated with digitization practices vary from project to project and from country to country. This study established that each digitization project had its own practices and strategies which were not standard.

A study by Ray (2004) revealed that all organizations with an interest in digitizing are concerned about preservation. The questions of what to digitize, the media to be included in the collection, the best way to protect digital information from degradation and the plan for data migration must be answered. Another study by Vrana (2011) revealed that there are other challenges for digitization projects. One of the main problems is that digital images may exist in various formats on different computerized networks.

Digitization of government in Kenya is one of the strategic pillars of the National ICT Master Plan (Mwirigi and Kinyanjui, 2012). The Government of Kenya is focused on digitizing its records for efficiency and improving service delivery. Already, several Government ministries, departments, and agencies are digitizing their records and processes. Some departments and agencies in Kenya like the procurement registry are badly in need of automation as their inefficiency was causing government a lot in the high cost of goods and services. Digitization in service organizations like the hospitals is expected to bring savings in the healthcare sector. Digitization in Kenya has generally progressed more slowly than in other countries in Africa and the rest of the world. However, there had been little research done to examine, for instance, the reasons for the lack of progress since the initiation of the national e-government project in Kenya since 2004. Moreover, there was very little published literature that identified the issues impeding e-government efforts in Kenya.

A study by Amollo (2011) concerning digitization of libraries in Kenya focused on the practices and challenges facing libraries in Kenya. However, this study tackled the case of libraries whereas the current study focused on digitization in Kenyan Government Departments. Another local study by Mwirigi and Kinyanjui (2012) focused on digitization and preservation of local content in the National Library of Kenya. This was a case study focused on library in Kenya.

The findings from the study though they gave insight into digitization could not be generalized to government digitization. In view of this, the current study sought to address the following questions: what are the practices involved in digitization project in the Kenyan Government Departments; what are the challenges that digitization

projects in Kenyan Government Departments have encountered, and; what are the strategies that can be applied for the digitization projects undertaken by the Government of Kenya to be a success.

1.3 Objectives of the Study

The objectives of this study were to:

i. Establish the practices involved in the digitization projects undertaken by departments in the Kenyan Government
ii. Determine the challenges that are faced in digitization in the Kenyan Government
iii. Determine strategies that can be applied for successful digitization in the Kenyan Government

1.4 Value of the Study

The findings from this study will be of importance to government departments that have digitization projects. This is because the study will give an in-depth insight on the best practices, challenges and strategies to cope with those challenges. This will give the digitization project implementers a feel of what needs to be done for the digitization projects in other public organizations and the government in general.

The study will also be of value to theory and scholarship. The study findings will be useful for theory. This study will add to the body of knowledge on e-government implementation. This will be useful to scholars, teachers and researchers in the study area. There is a dearth of local research on challenges to e-government project implementation and this study will add to that important area. Scholars and

academicians on e-government can use the study as reference material in their writing or teaching. Researchers can also use this study for conceptual argument in their studies. Future researches can also be done to improve on the limitations that will be documented in this study.

The departments digitizing their operations can use findings from this study to analyze deeply the experiences of the government department's digitization project from the point of view of their employees who are involved in the project. This study will also identify key issues and challenges facing digitization projects implementation. The department can therefore use the study findings to establish the challenges behind the slow implementation of the projects and can act accordingly. The study will also explore the major causes of the issues and provide broad strategies and policy recommendations to address them. This will give the departments an alternative way of dealing with the challenges which can turn around the projects implementation.

The study findings can also be useful to the government in general and its other public agencies which are in the process of implementing e-government projects. The study findings will examine the challenges in the Kenyan Government digitization project whose findings can be generalizable to other government agencies due to the similar context. The study findings therefore can be applicable in streamlining implementation of e-government projects to give value for money and meet set targets in terms of time, budget and adoption.

ICT consultants can also apply the findings from this study as a learning tool to establish the challenges and practices in this projects which can build a better base for future ICT projects. These consultants can use the study findings to enrich their knowledge and skills which they can use in managing future ICT projects.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter is devoted to reviewing literature relevant to the current study. It provides a critical look at the theoretical literature on best practices in digitization, challenges in digitization projects and strategies that should be applied in digitization projects. The chapter further presents empirical review whether earlier studies on practices, challenges and strategies in digitization projects is presented. Relevant literature is presented and discussed under different sub-sections as outlined hereunder.

2.2 Digitization Process

For digitization projects to be a success, equipment and infrastructure must be available and up to date. Everything needed for digitization in form of equipment and infrastructure include electricity, quality scanners, storage units and IT infrastructure (Sabbagh et al, 2012). Communication is another important aspect in digitization. Communication serves four major functions within a group: control, motivation, emotional expression, and information. In a digitization project, teams primarily focus on two functions: motivation (what is to be done, how well we do, what we can improve) and information (what was done, make decisions by transmitting data to identify and evaluate alternatives).

Training is another important process. Building the digitization infrastructure and implementing digitization projects require technical expertise (Koelling, 2004). To ensure a strong start for the project, it is critical to have digitization training for all staff to understand the fundamentals of digital imaging. The training should include

topics such as basics of digital images, scanning modes, file naming conventions, image file formats, an overview of image compression, resolution targets, and quality control. The staff members are then expected to go back and train other staff.

The primary goal of any digitization project is to preserve and provide access to the materials and records. In digital imaging there is no difference in terms of digitization standards and best practices. Standards should be set for the project and best practices should be documented and followed during the implementation process (Yakout et al, 2006).

In scanning and quality control, there should be workers responsible for this important aspect. Quality control (QC) work involves inspection of delivered files, which verifies media integrity, file readability, image quality, directory structures, and file naming (Hughes, 2004). Digital images are reviewed on screen and are randomly selected for examination through digital preservation tools. During the QC process, technicians should identify missing or incomplete pages, pages out of sequence, images in wrong scanning mode, and skewed images to evaluate the image quality of text and images (Lee, 2001).

File-naming conventions are also an important practice in digitization (Sabbagh et al, 2012). A file name is the only identifier for a file in any computer system. Every digitization project should have a clearly documented file naming policy that provides managerial activities related to creation, management, use and disposition of files. There should be at least the following considerations when designing the file-naming

conventions: version control; uniqueness; persistence; access, and; scalability (Hughes, 2004).

Version control establishes whether it is possible to have multiple versions of digital files or digital surrogates (Bailey-Hainer & Urban, 2004). For example, a master file for digital preservation, and an access file for online delivery, or newer versions of a digital file. Without version control, identical file names would create file management problems. Uniqueness involves ability of a file to separate itself from others in any computer systems. A file naming schema therefore cannot rely on its location information such as computer systems and storage. Persistence entails ability of a file name to be able to sustain itself over time. When technology changes, there is no need to change or modify file names. Access involves readability and accessibility. A file name should be readable and accessible in any computer systems regardless of any language settings (Al Neimat, 2010). A simple convention should be consistently used, and all file names consistently named for easier management. Scalability is the ability to accommodate all cases. A file naming convention should be scalable to accommodate all the cases.

A theoretical paper by Zarndt (2011) titled ‘Project management 101: Plan well, communicate a lot, and don't forget acceptance criteria!’ indicated that in digitization project, the three most common and most serious challenges are inadequate planning, an insufficient communication between the various stakeholders, and poorly defined acceptance criteria. Cervone (2009) observed that the primary causes for the failure of complex IT projects include: poor planning; unclear goals and objectives; objectives changing during the project; unrealistic time or resource estimates; lack of executive

support and user involvement; failure to communicate and act as a team; and inappropriate skills.

Digitization of national and library resources poses a great deal of challenge to the major stakeholders, that is, the management/government, employees and users (Mwirigi and Kinyanjui, 2012). The organization or government has to source for funds for the digitization project. Management of the digitization project entails policy initiation, setting priorities and planning. These are challenging tasks for the project management. The project management needs to consult other successful government or entities that had digitized their materials so as to learn from their experiences. This guides a lot while formulating policies on the digital project. A planning committee has to be set up. It is the responsibility of this committee to draw plans and budget for the project.

The project management also needs to prioritize the different activities involved and assign each task to a committee. Time limits should be assigned for completion of each task (Kenney & Rieger, 2000). The task of carrying along all the staff and guiding employees and users can be challenging. Some of the staff likes to resist change, particularly those that are not computer literate. It is essential for the project management to explain the essence of the project to them and arrange to retrain the employees so that they can participate in the project and remain functional in a digital office (Grout et al, 2000). Some of the content users definitely find it difficult to search for materials in the digital terrain. It is good for public servants to be available to render assistance.

This following section outlines the various studies that had been carried out by different researchers on practices, challenges and strategies in digitization projects.

2.3 Practices in Digitization Projects

The practices adopted in a digitization project affect the success of the digitization project. Bailey-Hainer and Urban (2004) studied the Colorado digitization program to establish the practices that were involved in the project. The study established that the first step in the Heritage Colorado grant was to do an environmental scan of the technology and knowledge at the participant institutions. The results of the environmental scan were used to guide the metadata working group in developing standards. The environmental scan showed an adequate level of automation among those, doing digitization.

The other practice that made the Colorado digitization project to be a success was having standards and software required (Bailey-Hainer & Urban, 2004). The project also ensured that collaboration with different stakeholders was achieved which harmonized activities in the project. Representatives from all of the different types of cultural heritage institutions met with technical staff from the State Library and the Alliance to look at standards to apply. They picked Dublin Core as the standard for Colorado. The pre-existing records at Denver Public Library and Boulder Public Library were in MARC format, but the group felt that these records could be incorporated into the project through a cross database searching interface.

A study by Belcher and Sexton (2008) had the purpose of presenting the process, challenges and lessons learned from carrying out a small digital project to create a

web resource of unique historic materials related to crime in New York City. Experiences from project administration, including management of a combination in-house and outsourced digitization and metadata were discussed. Formation and management of the resulting web resource was explained, which was the product of a creative amalgamation of commercial and open source software. Challenges encountered were presented with suggestions for practical solutions and considerations for future projects. The study findings revealed that the project was successful due to major practices including In-house digitization, having the required hardware and software infrastructure, having scanning specifications and file naming conventions.

The study by Belcher and Sexton (2008) revealed that before the digitization project, the project directors had gained some digital experience by scanning special collections materials requested by patrons, and electronic reserve materials for faculty. The project directors also had library school training and experience in digitization and preservation management. The study also established that The METRO digitization grant provided funds to purchase a large format good quality scanner with Silverfast AI scanning and calibration software. Also purchased was an IT8 color calibration target to assure good quality digital masters. The library already had updated PC computers loaded with commercial software sufficient for digital object and metadata creation and storage.

Belcher and Sexton's (2008) study also revealed that scanning specifications were set for the project which was based on Western States Digital Imaging Best Practices Version 1.0. Scanning went pretty quickly, as the material grouped into a few

consistent sizes from 11 to 2.75 inches. Files were named, saved to the server, then the master TIFF file opened in Adobe Photoshop to derive a web-optimized JPEG with resolution of 150 pixels/inch, with 600 pixels across the longer dimension. Thumbnails were not made, as unlike some content management systems, Greenstone, the software chosen to web-deliver the collection, automatically created them.

The study by Belcher and Sexton (2008) also revealed that file-naming conventions are very important for managing all digital object collections. Tracking and identifying digital objects was eased by following a logical file naming convention. Some programs only allow a certain number of characters in file names. In addition, carefully controlled file-naming conventions were useful for sorting like objects together in search and browse results. For this project a file naming convention was developed that resulted in “readable” and predictable names, based on information about the collection from which the original artifact came, and indicators of the front, back and related original documents.

A study by Rafiq and Ameen (2013) about digitization in university libraries of Pakistan revealed that having digitization policy, engaging in digitization best practices and having a criteria and standards for digitization and having well laid down digitization priorities were important practices. Other practices included establishing clearly the subject content of digitized resources and having clear goals of digitization activities.

2.4 Challenges in Digitization Projects

A study by Sabbagh et al (2012) measured digitization for a sample of 150 countries on a scale of 0 to 100, with 100 being the most advanced, and then isolated four distinct stages of digitization development: constrained, emerging, transitional and advanced. The authors observed that these groupings would allow policymakers to recognize their nation's current level of digitization and provide perspective on how to progress. In the constrained economies which were those with a digitization score below 25 faced challenges in realizing basic digitization building blocks such as widespread access and affordability. In these nations, services remained expensive and limited in reach. In emerging economies that had a score between 25 and 30, these had largely addressed the affordability challenge and had achieved significant progress in providing affordable and widespread access. However, the reliability of services in emerging digitization nations remained below par and capacity was limited.

The study by Sabbagh et al (2012) also revealed that transitional was the next digitization stage, encompassing those countries with a digitization score in the range of 30 to 40. Countries in the transitional stage had addressed the reliability challenge and provided citizens with access to ubiquitous, affordable, and reasonably reliable services. Alongside the jump in reliability, transitional countries showed minor advances in the speed, usability, and skill indexes. Advanced was the most mature stage of digitization, achieved with a score greater than 40. These countries had made significant strides in addressing ICT usability and developing a talent base to take advantage of available technologies, products, and services while improving the speed and quality of digital services.

A study by Bailey-Hainer and Urban (2004) revealed that there are numerous challenges for digitization projects. The study established that one of the main problems is that digital images may exist in various formats on different computerized networks: project staff needs to determine a fixed location for the images, and make access for users easier. Employees have to learn how to integrate the digitized material into their standard collection. Employees have to learn how to retrieve digital software, and obtain the resources that accompany it, in order to provide an efficient service to users. Employees also have to preserve digital images, since digital materials do not generally last as long as traditional print materials.

The study by Bailey-Hainer and Urban (2004) also revealed that the building of digital collections in institutions is a very complex process. One of the main issues emphasized is preservation. As the technology becomes outdated, old digital software will become unreadable. This indicates that digital repositories have to constantly upgrade software and hardware from system to system as new technology warrants, and learn to adopt resource sharing in order to preserve materials.

Liu (2004) in a study of the best practices, standards and techniques for digitizing library materials in USA established that the main technological issues, problems and concerns for libraries that were digitizing collections concerned methods for capturing printed information for use in a digital setting. The equipment being used for the process in many instances was unreliable providing low quality images which was a challenge in many digitization projects. Much attention focused on the reliability of equipment and software. The study by Liu (2004) revealed that the digitization

process should not require too many steps and the equipment should be easy to use. The study also revealed that the image processing software should allow for curvature correction and tidying of the image created, meaning the record remains in original condition. Another technological issue was deciding on the size of the digital images on the library's Web site. Larger images took more time for the user to download. Another issue surrounded the storage of thousands of image files on the document management system.

A study by Iwhiwhu and Eyekpegha (2009) on digitization of Nigerian university libraries applied both qualitative and quantitative methods. The respondents constituted 40 professional and para-professional staffers drawn from universities. Findings revealed that the libraries lacked written policy on digitization, inadequate ICT infrastructures and manpower, fund, and inadequate government support. Users were not given user education/digital literacy to enable them adequately utilize the available digitized resources and services, thus posing challenges to effective information delivery.

Han (2010) in a study of digitization projects in Afghanistan aimed at addressing the digitization tasks, workflow, challenges, and solutions. Persistent identifiers, file-naming conventions, page-naming rules, and a digitization management system were discussed in detail since they were critical to the success of the project. The study analyzed the unique challenges for a long-distance collaboration on digitization. The study found that several components such as persistent identifiers, file-naming conventions, page-naming rules, and digitization management system were critical to the success of the project.

2.5 Strategies in Digitization Projects

There are different strategies that governments, libraries and organizations are using to digitize their repositories. A study by Liu (2004) on digitization of libraries in US established that some large university libraries, as well as some of the state digital initiatives, were studying what others were doing, how they were doing it, and what they perceived to be the important challenges or technical problems to overcome. These were then applied in those states or libraries that were digitizing their records.

Liu's (2004) study also revealed that state organs and libraries were using a set of standards with the ideal being to have one set of standards used by all libraries or state organs. The study established that libraries and state departments had concepts which were really only guidelines that were being turned to standards of practice in all departments and libraries.

A study by Vrana (2011) about organizational aspects of digitization projects in the Croatian public libraries established that digitization projects should be planned carefully and any improvisation should be avoided. The study established that a total of nine public libraries that took part in this research had a written plan for digitization of library materials which made the projects to report higher success rates.

The study by Vrana (2011) also established that to successfully perform digitization, employees need to be trained for digitization. The study established that 73.77 percent of public libraries thought that their staff were not trained satisfactory for digitization, 14.75 percent of public libraries thought that their staff were trained satisfactory for digitization and 11.47 percent could not estimate level of training of their employees.

Those institutions whose employees had required level of training reported higher success rates in their digitization projects.

In addition to having adequate number of employees for participation in digitization projects, organizations must have adequate infrastructure (room for digitization, servers, software etc), which would guarantee success of the digitization projects. Manzuch's (2009) study established that public institutions in the study, 76,66 percent did not have adequate infrastructure, 15.00 percent of the organizations had adequate infrastructure, and 8.33 percent could not estimate whether they had adequate infrastructure for digitization or not. The study by Manzuch (2009) also revealed that institutions which digitize records or material on their own need effective and up to date infrastructure not the old, inadequate or inexistent infrastructure.

Human resources management is among the most important aspects in organization of digitization projects (Yakel, 2004). He also observed that if an organization is unable to select the sufficient number of trained employees to digitize records and material, chances are that digitization projects will fail. Of the institutions that were involved in digitization in this study, 80.70 percent indicated that their organization did not have enough employees who would be able to participate in digitization projects full time. Only 5.26 percent of the organizations had sufficient number of employees for digitization and 14.03 percent could not estimate their current human resources digitization capacities. Having sufficient and well trained personnel is an important aspect in any digitization project.

2.6 Summary

This study examines the concept of digitization, the process of digitization, challenges and strategies applied by Kenyan government departments. This section has reviewed previous theoretical and empirical literature and indicated how the current study will be different from the previous studies. Digitization has been shown to imply conversion of documents and art works into digital images. Digital images in this study mean electronic copies of documents. Digitization is a process in which materials are converted from the hard copies to electronic copies.

The major purposes of digitization have been indicated to be to enhance access and improve preservation of materials. A number of practices, challenges and strategies in digitization have also been presented in this section. These challenges include human and technical problems, which have implications for planning and policy. However, digitization is an essential task in modern day offices, because of the current challenges, and the need to go digital, that is, provide online services. The next section provides the research methodology that was applied in carrying out the study.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter explains the methodology that was used in the study. This involves the research design, study population, sampling technique, sample size, data collection methods and data analysis. The methodology includes using logical methods in collecting data. The nature of the study guided the designed approach that ensured appropriate data within the scope of the research study was obtained to answer the research questions.

3.2 Research Design

This study applied descriptive survey design. The method is designed to describe the characteristics or behaviors of a particular population in a systematic and accurate fashion and to focus on a number of subjects which have similar observable characteristics. Descriptive research is designed to provide a picture of a situation as it naturally happens. It may be used to justify current practice and make judgment and also to develop theories (Creswell, 2008). For the purpose of this study, descriptive research was used to obtain a picture of digitization practices, challenges and strategies applied in Kenyan Government with a view to improving the digitization process in the government departments.

Descriptive survey is aimed at getting information about practices, challenges and strategies in digitization projects in the government departments of Government of Kenya so that the findings can be applied to improve practice (Mugenda and Mugenda, 2003). This made a descriptive study well suited for this study where the

research instrument was applied to seek information from project leaders in government departments that had rolled out digitization projects.

3.3 Population

The population is the total number of respondents selected for the study. In this case the target population was all ministries (departments and agencies) in the Government of Kenya as at 30th June 2013 (Appendix 2).

3.4 Sample and Sampling Technique

Sampling is the selection of respondents who represent the target population in the study (Cooper and Schindler, 2006). In this study, judgmental sampling was applied to select 38 government departments that had rolled out or were in the process of implementing digitization. The departments were selected due to their similar characteristics. They all created records which were later preserved permanently. The respondents selected for the study had the knowledge and experience on the digitization projects.

3.5 Data Collection

The research instrument was a questionnaire. The questionnaire had both closed and open-ended questions. The questionnaire had four sections. Section A captured the demographic information of the respondents and the departments. Section B had data relating to practices adopted in the digitization project. Section C contained data relating to challenges encountered in the digitization project and Section D covered strategies used in digitization to cope with challenges faced. The sample questionnaire is provided in appendix I.

The researcher administered the questionnaires using “drop and pick later” method. One subject from each department (preferably the project leader) was selected to respond to the questionnaire. This resulted to 38 potential respondents.

3.6 Data Analysis

All questionnaires from the respondents were verified and checked for completeness. The data was coded and entered into SPSS (Software Package for Social Sciences) for windows which generated percentages, means and frequency distributions. Section A regarding demographics were analyzed based on percentages and frequencies. Data relating to Section B, C and D were analyzed through mean scores, percentages and standard deviation. Factor analysis was also used to establish the major practices, challenges and strategies applied in digitization in Kenyan Government. The presentation of findings from quantitative data was by use of tables.

CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND DISCUSSION

4.1 Introduction

This chapter discusses data analysis, findings and discussion of the study. The objective of the study was to establish the practices, challenges and strategies in Digitization projects in the Kenyan Government.

Data was collected through questionnaires which were sent to project leaders in government departments that had digitization projects or had completed digitization projects. Out of 38 questionnaires administered to the respondents, 32 of them were returned for data analysis. This was a response rate of 79% which was considered adequate for the research purpose. The respondents included Project team leaders, IT officers, IT directors, Project team members and IT project managers among others. The analysis presented in the following sections is as per the 30 returned questionnaires.

4.2 Demographic Information

This section provides the findings of the study on the general and demographic information. Findings presented in this section include gender of the respondents, age, education levels and the number of years the respondents had worked in the department. Other general information presented in this section includes sources of project funding, year the project commenced and the stage of completion of the digitization project. The personnel undertaking the digitization and the material being digitized information was also included.

4.2.1 Gender of Respondents

One of the general questions involved the gender of the responding subjects. Results are presented in Table 4.2.1.

Table 4.2.1: Gender of Respondents

Gender	**Frequency**	**Percent(%)**
Male	21	70
Female	9	30
Total	**30**	**100**

Source: Researcher, 2013

Study results presented in Table 4.2.1 indicates that 70% of the respondents were male with 30% being female. From the results most of respondents were male.

4.2.2 Age of Respondents

The study sought to find out the age of the respondents which is captured in Table 4.2.2.

Table 4.2.2: Age of Respondents

Age in years	**Frequency**	**Percent(%)**
18 – 25	0	0
26 – 30	4	13
31 – 35	8	27
36 – 40	12	40
41 – 45	5	17
46 – 50	1	3
Above 50	0	0
Total	**30**	**100**

Source: Researcher, 2013

Results presented in Table 4.2.2 indicate that the respondents to the questionnaires were very varied in relation to age where 40% were aged between 36 and 40 years,

with no respondent was over 50 years of age or below 26 years. This result indicates that those who participate in the digitization projects are either middle aged or young.

4.2.3 Education of Respondents

The education of the respondents was also investigated where respondents were required to indicate whether their education was IT related or not. Study findings are presented in Table 4.2.3.

Table 4.2.3: Education of Respondents

Type of Education	**Frequency**	**Percent (%)**
IT related	23	77
Not IT Related	7	23
Total	**30**	**100**

Source: Researcher, 2013

Study results presented in Table 4.2.3 indicate that 77% of the respondents had IT related education while 23% did not have IT related education. This result indicates that most of the departments and agencies had team members and leaders who had IT related education which served to ensure that the projects were well equipped technically and which is relevant to the study.

4.2.4 Years of Experience in Department

The years the respondents had worked in the department or agency was investigated. Results are presented in Table 4.2.4.

Table 4.2.4: Years of Experience in Department

Years of experience	Frequency	Percent (%)
Below 3 years	6	20
3 – 6 years	13	43
7 – 10 years	6	20
Above 10 years	5	17
Total	**30**	**100**

Source: Researcher, 2013

Study findings presented in Table 4.2.4 indicated that 43% of the respondents had worked in the departments or agencies for between 3 and 6 years while those who had more than 10 years in the same department were 17%. These results give the impression that most respondents had worked in the same organization long enough. This therefore indicated that the respondents had valuable information to provide for the study purpose.

4.2. 5 Source of Project Funding

How the digitization project was funded was inquired. A project can be funded from internal funds or funds that are external to the department or agency implementing the project. Results from this question are presented in Table 4.2.5.

Table 4.2.5: Source of Project Funding

Funding Source	Frequency	Percent (%)
Department only	11	37
External Sources	8	27
Grant awarding agencies only	4	13
Department and grants	7	23
Total	**30**	**100**

Source: Researcher, 2013

Study results presented in Table 4.2.5 indicate that 37% of the projects were funded wholly by the department, 27% were funded from external sources with 23% being

jointly funded by the department and grant awarding agencies. Those projects that were funded wholly by grant awarding agencies were 13%.

4.2.6 Year the Project Commenced

The year the project was started was also inquired where responses were analyzed and presented in Table 4.2.6.

Table 4.2.6: Year the Project Commenced

Year	Frequency	Percent(%)
2009	4	13
2010	6	20
2011	4	13
2012	9	30
2013	7	23
Total	**30**	**100**

Source: Researcher, 2013

Results presented in Table 4.2.6 reveal that digitization projects that started in 2012 were 30%, those that started in 2009 were 13% same as those that started in 2011. This points to the fact that digitization in the Kenyan Government is a new concept as there was no project that was more than 5 years old.

4.2.7 Stage of Completion

Another factor that was investigated was the stage of completion of the digitization project. Respondents were required to indicate the percentage of work completed on the project with those completed being rated at 100%. Results are presented in Table 4.2.7.

Table 4.2.7: Stage of Completion

Completion stage	Frequency	Percent (%)
Less than 25%	6	21
25%	3	11
50%	4	14
75%	7	25
100%	8	29
Total	**28**	**100**

Source: Researcher, 2013

Study results as presented in Table 4.2.7 reveal that 29% of the digitization projects had completed. Those that were less than 25% completed were 21% while those that were around 25% completed were 11%.

4.2.8 Personnel Undertaking the Digitization

The study further enquired on the personnel that were undertaking the digitization. Results are presented in Table 4.2.8.

Table 4.2.8: Personnel Undertaking Digitization

Project personnel	Frequency	Percent
Departmental staff	8	26
Consultant	9	30
Both	13	44
Total	**30**	**100**

Source: Researcher, 2013

Results as presented in Table 4.2.8 reveal that 44% of the digitization projects were undertaken by the departmental staff in conjunction with consultants. 30% of the projects were undertaken by consultants only while those undertaken by the client department only were 26%.

4.2.9 Material Being Digitized

The study further sought to establish the kind of materials the projects were or had digitized. Results are presented in Table 4.2.9.

Table 4.2.9: Materials being digitized

Materials digitized	Frequency	Percent
Data	10	33
Documents	15	50
Images	5	17
Total	**30**	**100**

Source: Researcher, 2013

Results presented in Table 4.2.9 indicates that 50% of the projects were digitizing documents with 17% digitizing images and 33% digitizing data.

4.3 Practices in Digitization

This research study had an objective of establishing the practices involved in the digitization projects undertaken by departments and agencies in the Kenyan government.

4.3.1 Descriptive Statistics for Practices in Digitization.

Respondents were required to indicate the extent to which each of the listed practice was applied in the digitization project in the department or agency. The rating that was used was 1- No extent, 2 – Small extent, 3 – Moderate extent, 4 – Great extent and 5 – Very great extent. Responses were analyzed through mean scores. Mean scores were interpreted as follows: 1- 1.5 as No extent; 1.5 – 2.5 as Small extent; 2.5 – 3.5 as Moderate extent; 3.5 – 4.5 as Great extent and above 4.5 as Very great extent. The standard deviation describes the distribution of the responses to mean. It provides

an indication of how far individual responses to each factor vary from the mean. A standard deviation of more than one 1 indicates a great variation in the response meaning respondents did not have a consensus on their views, while a standard deviation of less than 1 indicates less variation in the responses. The results from the analysis are presented in Table 4.3.1.

Table 4.3.1: Practices in Digitization

Practices	**Mean Score**	**Std deviation**
Specifying the need for creating the digital collection	4.52	1.32
Policy enactment	3.68	0.87
Policy Approval	3.71	0.88
Planning, budgeting and monitoring	3.14	1.12
Selection of activities and processes	3.72	0.71
Assessment of activities and processes	3.59	0.64
Prioritization of activities and processes	3.63	1.26
Communication and coordination of digitization project	2.78	1.04
Setting up the necessary technical infrastructure and expertise.	2.84	1.32
Selecting of equipment and components	3.71	0.90
Planning on how to track records throughout the process	3.84	1.04
Setting digital copy status and records management standards	2.63	1.06
Definition of essential characteristics by defining legal admissibility/authenticity of digital copies of records, if applicable	3.07	1.35
Evaluation of physical condition of records and readiness for scanning	2.74	1.25
Determination of format to be used in workflow and systems standardization	3.16	1.02
Selection of documents/material for digitization	3.45	1.09
Preparation for digitization (hardware; software; environment)	3.76	1.03
Moving original materials	2.65	1.08
Manipulating original materials	2.88	1.14
Scanning of the materials	4.36	0.71
Metadata preparation	3.97	0.84
Collection, creation, management, and reuse in other systems of all types of metadata	4.06	0.63
Quality assurance and quality control of metadata	4.71	0.97
Validation and verification of metadata	3.76	1.74
Image processing	4.62	1.06
Digital reformatting	3.67	0.85
Quality management, quality assurance and quality control	3.87	0.76

of digital copies		
Technical verification of digital objects to technical standards	4.05	0.72
Quality Review of digital copies	4.17	0.88
Project naming and file organization	4.58	0.94
Submission of digital resources to delivery systems and digital repository	3.78	1.78
Linking the digital repository to all appropriate IT systems	3.91	0.84
Staff training	3.88	1.31
Management of archival information package (content preservation)	4.64	0.89
Provision of access to dissemination information package to end-users	3.96	0.63
Project assessment, evaluation and reporting	2.71	1.07

Source: Researcher, 2013

Study results presented in Table 4.3.1 indicate that practices that were followed to a very great extent in the digitization projects included quality assurance and quality control of metadata (4.71), management of archival information package (content preservation) (4.64), image processing (4.62), project naming and file organization (4.58) and specifying the need for creating the digital collection (4.52). Practices that were involved to a great extent included quality review of digital copies (4.17) and collection, creation, management, and reuse in other systems of all types of metadata (4.06). Other practices involved to a great extent included technical verification of digital objects to technical standards (4.05) and provision of access to dissemination information package to end-users (3.97). However, the study established that there were practices that were involved to a moderate extent but were important including project assessment, evaluation and reporting (2.71), moving original materials (2.65), manipulating original materials (2.88) and evaluation of physical condition of records and readiness for scanning (2.74). Other practices involved to a moderate extent, included setting digital copy status and records management standards (2.63) and setting up the necessary technical infrastructure and expertise (2.84). However, there

are some important practices that are not involved to a great extent in the digitization projects in government which may compromise the success of the projects. These include project assessment, evaluation and reporting and evaluation of physical condition of records and readiness for scanning.

The practices with standard deviation of more than 1 indicate that respondents had no consensus while less than 1 indicate there was consensus on the responses obtained.

4.3.2 Factor Analysis on Practices

Responses on challenges were further subjected to factor analysis to establish the main factors in the practices in digitization projects.

4.3.2.1 Communalities

Communality is the proportion of variance that each item has in common with other items. The proportion of variance that is unique to each item is then the respective item's total variance minus the communality**.** Table 4.3.2 of communalities shows how much of the variance in the variables has been accounted for by the extracted factors. Communality matrix was extracted from the factor analysis where Table 4.3.2 shows the communalities.

Table 4.3.2: Factor Analysis (Communalities)

Digitization Practices	Initial	Extraction
Specifying the need for creating the digital collection	1.000	.529
Policy enactment	1.000	.454
Policy Approval	1.000	.571
Planning, budgeting and monitoring	1.000	.391
Selection of activities and processes	1.000	.189
Selection of activities and processes	1.000	.128
Prioritization of activities and processes	1.000	.600
Communication and coordination of digitization project	1.000	.359
Setting up the necessary technical infrastructure and expertise.	1.000	.605

Selecting of equipment and components	1.000	.241
Planning on how to track records throughout the process	1.000	.389
Setting digital copy status and records management standards	1.000	.713
Definition of essential characteristics by defining legal admissibility/authenticity of digital copies of records, if applicable	1.000	.868
Evaluation of physical condition of records and readiness for scanning	1.000	.803
Determination of format to be used in workflow and systems standardization	1.000	.399
Selection of documents/material for digitization	1.000	.440
Preparation for digitization (hardware; software; environment)	1.000	.921
Moving original materials	1.000	.765
Manipulating original materials	1.000	.492
Scanning of the materials	1.000	.365
Metadata preparation	1.000	.695
Collection, creation, management, and reuse in other systems of all types of metadata	1.000	.632
Quality assurance and quality control of metadata	1.000	.608
Image processing	1.000	.846
Digital reformatting	1.000	.899
Quality management, quality assurance and quality control of digital copies	1.000	.463
Technical verification of digital objects to technical standards	1.000	.593
Quality Review of digital copies	1.000	.415
Project naming and file organization	1.000	.882
Submission of digital resources to delivery systems and digital repository	1.000	.463
Linking the digital repository to all appropriate IT systems	1.000	.623
Staff training	1.000	.680
Management of archival information package (content preservation)	1.000	.323
Provision of access to dissemination information package to end-users	1.000	.775
Project assessment, evaluation and reporting	1.000	.695
Extraction Method: Principal Component Analysis.		

Source: Researcher, 2013

Results presented in Table 4.3.2 on communalities reveal how much of the variance in each of the original variables is explained by the extracted factors. Higher

communalities are desirable. If the communality for a variable is less than 50%, it is a candidate for exclusion from the analysis because the factor solution contains less that half of the variance in the original variable, and the explanatory power of that variable might be better represented by the individual variable.

4.3.2.2 Factor Extraction

This section shows all the factors extractable from the analysis along with their eigenvalues, the percent of variance attributable to each factor, and the cumulative variance of the factor and the previous factors. Factors were extracted using principal factor analysis with 6 factors being extracted as indicated in Table 4.3.3. The table presents total variance of all the factors. Principal component analysis was used to extract factors which totaled to 35. Eigen values indicate the relative importance of each factor accounting for a particular set and hence those with small Eigen value were left out. According to Table 4.3.3, only 6 factors were significant for the analysis.

Table 4.3.3: Factor Extraction (Total Variance Explained)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.493	12.838	12.838	4.493	12.838	12.838
2	3.677	10.505	23.343	3.677	10.505	23.343
3	3.244	9.269	32.612	3.244	9.269	32.612
4	3.115	8.899	41.511	3.115	8.899	41.511
5	2.844	8.125	49.637	2.844	8.125	49.637
6	2.441	6.975	56.611	2.441	6.975	56.611
7	2.209	6.312	62.924			
8	2.021	5.773	68.697			
9	1.805	5.157	73.854			
10	1.472	4.205	78.059			
11	1.380	3.943	82.002			
12	1.007	2.878	84.880			

13	.973	2.780	87.661			
14	.885	2.528	90.189			
15	.710	2.028	92.217			
16	.614	1.755	93.972			
17	.447	1.278	95.250			
18	.396	1.132	96.382			
19	.355	1.014	97.396			
20	.238	.679	98.076			
21	.218	.621	98.697			
22	.201	.574	99.271			
23	.096	.275	99.546			
24	.075	.215	99.761			
25	.041	.118	99.879			
26	.027	.078	99.957			
27	.007	.020	99.977			
28	.005	.015	99.992			
29	.003	.008	100.000			
30	3.814E-016	1.090E-015	100.000			
31	1.422E-016	4.062E-016	100.000			
32	-1.805E-017	-5.158E-017	100.000			
33	-1.138E-016	-3.252E-016	100.000			
34	-1.714E-016	-4.898E-016	100.000			
35	-5.781E-016	-1.652E-015	100.000			

Source: Researcher, 2013

From table 4.3.3 we notice that the first factor accounts for 12.838% of the variance, the second 10.505%, the third 9.269%, the fourth 8.899 %, the fifth 8.125% and sixth accounts for 6.975% of the total variance. All the remaining factors are not significant.

4.3.2.3 Scree Plot

A Scree Plot which is a plot of the factor Eigen values against the component numbers. The Scree Plot in Figure 4.3.1 shows the factors that were extracted by indicating an elbow in the graph. In this case, 6 factors were extracted.

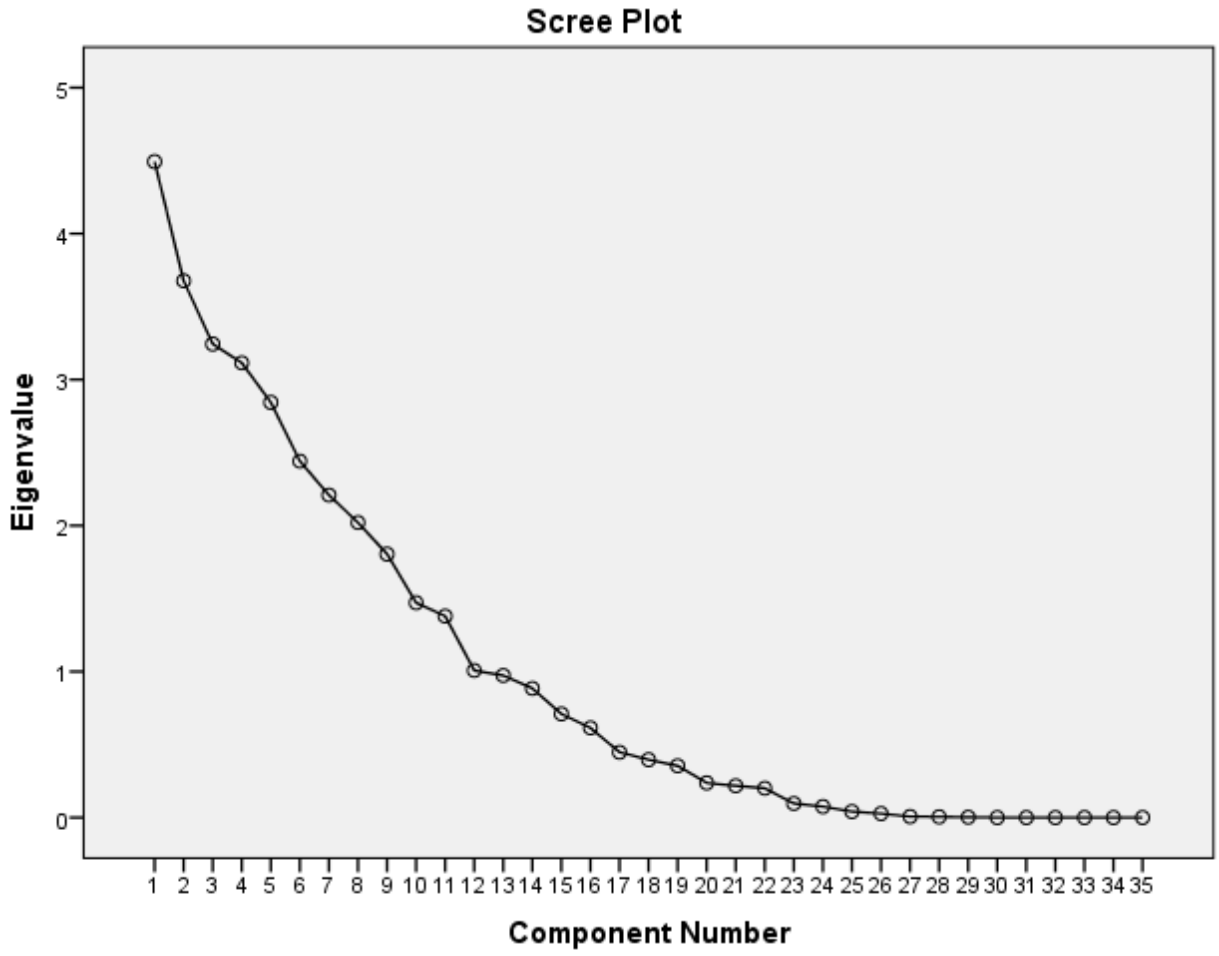

Figure 4.3.1: Scree Plot

The Scree Plot is a plot of factor Eigen values against the components number. According to Figure 4.3.1, we only consider 6 factors because the curve tends to flatten from the sixth component onwards, due to relatively low factor Eigen value.

4.3.2.4 Component Matrix

The table below shows the loadings of the thirty five variables on the six factors extracted. The higher the absolute value of the loading, the more the factor contributes

to the variable. A component matrix containing the Eigen values in respect to each factor was extracted from the factor analysis. The results are presented in Table 4.3.4.

Table 4.3.4: Factor Analysis (Component Matrix)

	Component					
	1	2	3	4	5	6
Specifying the need for creating the digital collection	-.324	.067	.528	.302	.174	.138
Policy enactment	.143	.086	-.373	.238	-.393	.275
Policy Approval	.369	.200	-.234	.326	-.248	-.415
Planning, budgeting and monitoring	.019	.165	-.234	.138	.145	-.518
Selection of activities and processes	.004	.199	.158	-.087	.338	-.051
Selection of activities and processes	-.114	-.152	-.171	.156	-.195	.019
Prioritization of activities and processes	.455	.515	.196	.034	.294	-.036
Communication and coordination of digitization project	-.017	.211	-.511	.138	.169	.073
Setting up the necessary technical infrastructure and expertise.	.099	-.318	.409	.439	-.051	.362
Selecting of equipment and components	-.082	.019	-.362	-.115	.127	.271
Planning on how to track records throughout the process	.318	-.349	.134	-.099	-.350	.125
Setting digital copy status and records management standards	.174	.734	.108	.062	-.044	.355
Definition of essential characteristics by defining legal admissibility/authenticity of digital copies of records, if applicable	.610	.027	-.146	.641	-.091	-.233
Evaluation of physical condition of records and readiness for scanning	.117	.432	-.184	.132	-.562	.486
Determination of format to be used in workflow and systems standardization	.224	.056	-.048	-.430	.208	.340
Selection of documents/material for digitization	.263	-.067	.016	-.390	-.085	.455
Preparation for digitization (hardware; software; environment)	.783	.150	.366	-.347	-.101	-.147
Moving original materials	.226	-.356	.552	.361	-.117	.373
Manipulating original materials	.145	.188	.127	.154	.628	-.042
Scanning of the materials	-.208	.001	.392	.307	.270	-.038
Metadata preparation	.345	-.107	-.565	.451	.202	.030

Collection, creation, management, and reuse in other systems of all types of metadata	-.310	-.186	.169	.116	.639	.224
Quality assurance and quality control of metadata	-.449	.454	.044	-.079	-.098	-.427
Image processing	.594	-.010	-.291	.430	.464	-.090
Digital reformatting	.762	.176	.389	-.285	-.107	-.208
Quality management, quality assurance and quality control of digital copies	-.173	.100	.426	.462	-.160	-.053
Technical verification of digital objects to technical standards	-.455	.496	.044	.029	-.110	-.354
Quality Review of digital copies	-.296	.011	.187	.044	-.476	-.255
Project naming and file organization	.762	.164	.330	-.350	-.095	-.183
Submission of digital resources to delivery systems and digital repository	-.173	.100	.426	.462	-.160	-.053
Linking the digital repository to all appropriate IT systems	.479	-.237	-.196	.521	-.156	.052
Staff training	-.299	.606	-.105	.206	-.197	.362
Management of archival information package (content preservation)	.013	.146	-.450	-.244	.088	.179
Provision of access to dissemination information package to end-user	.155	.666	.133	.111	.443	.285
Project assessment, evaluation and reporting	-.055	.787	.064	.093	-.219	.109
Extraction Method: Principal Component Analysis.						
a. 6 components extracted.						

Source: Researcher, 2013

The component matrix contains the relative Eigen values in respect of each factor. Each factor belongs to one of six set of factors extracted, and is determined by the Eigen values of the factors to each set. Each number represents the correlation between the item and the unrotated factor. The unrotated component matrix indicates the correlation of each practice with the extracted factors. The correlations help in interpreting the underlying factors. For example the variable 'Specifying the need for creating the digital collection' was in the 3rd factor with a loading of 0.528.

4.3.2.5 Rotated Component Matrix

Rotation component matrix is used to reduce the number factors on which the variables under investigation have high loadings. Rotation does not actually change anything but makes the interpretation of the analysis easier. Factors were rotated using varimax method. Results are presented in Table 4.3.5.

Table 4.3.5: Factor Analysis (Rotated Component Matrix)

	Component					
	1	2	3	4	5	6
Specifying the need for creating the digital collection	-.201	-.222	.090	.578	.091	.298
Policy enactment	-.114	.326	.387	-.139	.141	-.382
Policy Approval	.267	.566	.103	.057	-.348	-.211
Planning, budgeting and monitoring	.021	.293	-.134	-.039	-.526	.093
Selection of activities and processes	.081	-.100	.004	.005	-.096	.404
Selection of activities and processes	-.204	.106	-.015	.028	.012	-.272
Prioritization of activities and processes	.448	.196	.297	.011	-.074	.517
Communication and coordination of digitization project	-.284	.302	.198	-.336	-.154	.105
Setting up the necessary technical infrastructure and expertise.	-.084	.125	-.003	.516	.563	-.004
Selecting of equipment and components	-.264	.003	.105	-.386	.099	.044
Planning on how to track records throughout the process	.292	.020	-.127	.033	.392	-.365
Setting digital copy status and records management standards	.197	-.003	.776	-.003	.014	.267
Definition of essential characteristics by defining legal admissibility/authenticity of digital copies of records, if applicable	.242	.868	.057	.223	-.016	-.063
Evaluation of physical condition of records and readiness for scanning	.024	.093	.790	-.086	.172	-.365
Determination of format to be used in workflow and systems standardization	.173	-.184	.075	-.432	.301	.230
Selection of documents/material for digitization	.216	-.199	.130	-.332	.473	-.047
Preparation for digitization (hardware; software; environment)	.941	.049	.006	-.057	.146	.092
Moving original materials	.099	.075	-.026	.559	.660	-.032
Manipulating original materials	.016	.178	-.048	.056	-.035	.674

Scanning of the materials	-.155	-.054	-.071	.476	-.007	.327
Metadata preparation	-.214	.765	-.027	-.235	.075	.052
Collection, creation, management, and reuse in other systems of all types of metadata	-.438	-.144	-.230	.122	.208	.555
Quality assurance and quality control of metadata	-.048	-.287	.163	.130	-.693	-.003
Image processing	.085	.804	-.107	-.122	.081	.399
Digital reformatting	.936	.077	.008	.011	.084	.096
Quality management, quality assurance and quality control of digital copies	-.060	.018	.162	.656	-.049	-.017
Technical verification of digital objects to technical standards	-.103	-.231	.255	.185	-.655	.008
Quality Review of digital copies	.018	-.218	.031	.336	-.269	-.426
Project naming and file organization	.925	.057	-.002	-.078	.096	.089
Submission of digital resources to delivery systems and digital repository	-.060	.018	.162	.656	-.049	-.017
Linking the digital repository to all appropriate IT systems	.049	.698	-.011	.115	.275	-.211
Staff training	-.283	-.084	.758	.048	-.123	-.001
Management of archival information package (content preservation)	-.121	.013	.155	-.532	-.023	.027
Provision of access to dissemination information package to end-users	.080	.062	.541	-.015	-.003	.686
Project assessment, evaluation and reporting	.119	-.069	.759	.092	-.292	.077
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.						
a. Rotation converged in 6 iterations.						

Source: Researcher, 2013

Table 4.3.5 presents the rotated component matrix. The rationale for rotating factors comes from the fact that this procedure simplifies the factor structure and therefore makes its interpretation easier and more reliable. According to these criteria, a matrix of loadings (where the rows correspond to the original variables and the columns to the factors) is simplified. Varimax is undoubtedly the most popular rotation method by far. For varimax a simple solution means that each factor has a small number of large loadings and a large number of zero (or small) loadings. This simplifies the

interpretation because, after a varimax rotation, each original variable tends to be associated with one (or a small number) of factors, and each factor represents only a small number of variables. In addition, the factors can often be interpreted from the opposition of few variables with positive loadings to few variables with negative loadings. For example in Table 4.3.5, 'Specifying the need for creating the digital collection' is a component in factor 4 with a correlation of 0.578.

4.3.2.6 Factor Isolation

This involved isolating each of the variables and grouping them by these 6 extracted factors. Table 4.3.6 presents the factors with a minimum correlation of 0.4.

Table 4.3.6: Isolation of factors

Factor group	Practices
Factor 1	• Prioritization of activities and processes • Preparation for digitization (hardware; software; environment) • Digital reformatting • Project naming and file organization
Factor 2	• Policy Approval • Definition of essential characteristics by defining legal admissibility/authenticity of digital copies of records, if applicable • Metadata preparation • Linking the digital repository to all appropriate IT systems
Factor 3	• Setting digital copy status and records management standards • Evaluation of physical condition of records and readiness for scanning • Staff training

	• Project assessment, evaluation and reporting
Factor 4	• Specifying the need for creating the digital collection • Setting up the necessary technical infrastructure and expertise. • Moving original materials • Scanning of the materials • Quality management, quality assurance and quality control of digital copies • Submission of digital resources to delivery systems and digital repository
Factor 5	• Setting up the necessary technical infrastructure and expertise. • Selection of documents/material for digitization • Moving original materials
Factor 6	• Selection of activities and processes • Manipulating original materials • Collection, creation, management, and reuse in other systems of all types of metadata • Provision of access to dissemination information package to end-users

Source: Researcher, 2013

Table 4.3.6 presents the variables in the six factors extracted. Factor 1 included variables such as prioritization of activities and processes, preparation for digitization (hardware; software; environment), digital reformatting and Project naming and file organization. Factor 1 can be called “preparation for digitization”. Factor 2 contains elements such as setting digital copy status and records management standards, Evaluation of physical condition of records and readiness for scanning, Staff training and Project assessment, evaluation and reporting. Factor 2 can be called “standardization”.

Factor 3 contains practices such as setting digital copy status and records management standards, evaluation of physical condition of records and readiness for scanning, staff training and project assessment, evaluation and reporting. Factor 3 practices deal with preparation for scanning. Factor 4 contained practices such as specifying the need for creating the digital collection and setting up the necessary technical infrastructure and expertise. The factor also contained practices such as moving original materials, scanning of the materials and quality management, quality assurance and quality control of digital copies. The factor also contained the practice of submission of digital resources to delivery systems and digital repository. Factor 4 can be called " scanning of the materials".

Factor 5 contained practices such as setting up the necessary technical infrastructure and expertise, selection of documents/material for digitization and moving original materials. Factor 5 can be called "setting up infrastructure and materials for Digitization". Factor 6 included practices such as selection of activities and processes and manipulating original materials. The factor also contained the practice of collection, creation, management, and reuse in other systems of all types of metadata and also provision of access to dissemination of information package to end-users. Factor 6 can be called "selection of activities and processes" all the practices in this group are related to selection of activities and processes.

4.4 Challenges in Digitization

The study had an objective of determining the challenges that are faced in digitization in the Kenyan Government.

4.4.1 Descriptive Statistics for Challenges in Digitization

Respondents were required to indicate the extent to which the department had encountered each of the listed challenges in digitization. The rating that was used was 1- No extent, 2 – Small extent, 3 – Moderate extent, 4 – Great extent and 5 – Very great extent. Responses were analyzed through mean scores. Mean scores were interpreted as follows: 1- 1.5 as No extent; 1.5 – 2.5 as Small extent; 2.5 – 3.5 as Moderate extent; 3.5 – 4.5 as Great extent and above 4.5 as Very great extent. The standard deviation on the other hand describes the distribution of the responses in relation to the mean. It provides an indication of how far the individual responses vary from the mean. A standard deviation of more than one 1 indicates a great variation in the response meaning respondents did not have a consensus on their views, while a standard deviation of less than 1 indicates less variation in the responses. The results from the analysis are presented in Table 4.4.1.

Table 4.4.10: Challenges in Digitization

Challenge	Mean score	Std Deviation
Poor planning for the digitization project	2.81	1.24
Lack of digitization standards	3.37	0.96
Poor technical expertise	3.87	0.81
Inadequate digitization facilities or infrastructure	4.31	0.79
Improper handling of original documents	4.38	1.12
Inadequate staff in the project	4.39	0.86
Lack of high level management support	2.45	0.98
Lack of understanding of the importance digitization	4.27	0.79
Long procurement procedures for project resources	4.35	0.81
Inadequate funding	3.25	1.24
Poor sensitization of employees and users	3.09	1.20
Fast changing technology challenging preservation of digital content	2.58	1.04
Lack of Psychological preparation of the employees	2.94	1.30
Poor User interface	3.21	0.91
Poor quality of digital content	3.97	1.32
Lack of technical know how on project staff	4.21	0.87
Poor preservation of the digital content	2.27	1.04

Source: Researcher, 2013

Study results presented in Table 4.4.1 reveal that challenges that affected most digitization projects in the Government of Kenya to a great extent included inadequate staffing in the project (4.39) and improper handling of original documents (4.38). Other challenges that affected digitization projects to a great extent included long procurement procedures for project resources (4.35), inadequate digitization facilities or infrastructure (4.31), lack of understanding of the importance digitization (4.27) and lack of technical know how on project staff (4.21). Study results also revealed that poor quality of digital content (3.97) and poor technical expertise (3.87) were other challenges that affected the digitization projects to a great extent. The challenges with standard deviation of more than 1 indicate that respondents had no consensus while less than 1 indicate there was consensus on the responses obtained.

4.4.2 Factor Analysis on Challenges

Responses on challenges were further subjected to factor analysis to establish the main factors in the challenges in digitization projects.

4.4.2.1 Communalities

Communality is the proportion of variance that each item has in common with other items. The proportion of variance that is unique to each item is then the respective item's total variance minus the communality**.** Table 4.4.2 of communalities shows how much of the variance in the variables has been accounted for by the extracted factors. Communality matrix was extracted from the factor analysis where Analysis of findings (communalities) is as presented in Table 4.4.2.

Table 4.4.2: Factor Analysis (Communalities)

	Initial	Extraction
Poor planning for the digitization project	1.000	.717
Lack of digitization standards	1.000	.837
Poor technical expertise	1.000	.801
Inadequate digitization facilities or infrastructure	1.000	.685
Improper handling of original documents	1.000	.867
Inadequate staff in the project	1.000	.827
Lack of high level management support	1.000	.821
Lack of understanding of the importance digitization	1.000	.922
Long procurement procedures for project resources	1.000	.855
Inadequate funding	1.000	.726
Poor sensitization of employees and users	1.000	.670
Fast changing technology challenging preservation of digital content	1.000	.661
Lack of Psychological preparation of the employees	1.000	.829
Poor User interface	1.000	.928
Poor quality of digital content	1.000	.936
Lack of technical know how on project staff	1.000	.780
Poor preservation of the digital content	1.000	.813
Extraction Method: Principal Component Analysis.		

Source: Researcher, 2013

Results presented in Table 4.4.2 on communalities reveal how much of the variance in each of the original challenges is explained by the extracted factors. Higher communalities are desirable. The result indicates that no variable had less than 0.5 of variance explained.

4.4.2.2 Factor Extraction

Table 4.4.3 shows all the factors extractable from the analysis along with their eigenvalues, the percent of variance attributable to each factor, and the cumulative variance of the factor and the previous factors. Factors were extracted using principal factor analysis with 5 factors being extracted as indicated in Table 4.4.3.

Table 4.4.3: Factor Extraction (Total Variance Explained)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.458	20.344	20.344	3.458	20.344	20.344
2	2.381	14.005	34.349	2.381	14.005	34.349
3	2.092	12.304	46.652	2.092	12.304	46.652
4	1.795	10.560	57.212	1.795	10.560	57.212
5	1.666	9.797	67.009	1.666	9.797	67.009
6	1.148	6.753	73.762	1.148	6.753	73.762
7	1.136	6.681	80.443	1.136	6.681	80.443
8	.724	4.259	84.702			
9	.615	3.616	88.318			
10	.498	2.931	91.248			
11	.456	2.680	93.928			
12	.424	2.494	96.423			
13	.214	1.260	97.683			
14	.177	1.043	98.726			
15	.117	.689	99.415			
16	.059	.345	99.760			
17	.041	.240	100.000			

Source: Researcher, 2013

Study results presented in Table 4.4.3 presents total variance of all the factors. Principal component analysis was used to extract factors which totaled to 17. Eigen values indicate the relative importance of each factor accounting for a particular set and hence those with small Eigen value were left out. According to Table 4.4.3, only 7 factors were significant for the analysis. From table 4.4.3 we notice that the first factor accounts for 20.344% of the variance, the second 14.005%, while the last factor accounts for 6.681% of the total variance. All the remaining factors are not significant.

4.4.2.3 Scree Plot

A Scree Plot which is a plot of the factor eigen values against the component numbers. The scree plot is a graph of the eigenvalues against all the factors. The graph is useful for determining how many factors to retain. The Scree Plot in Figure 4.4.1 shows the factors that were extracted by indicating an elbow in the graph. In this case, 7 factors were extracted.

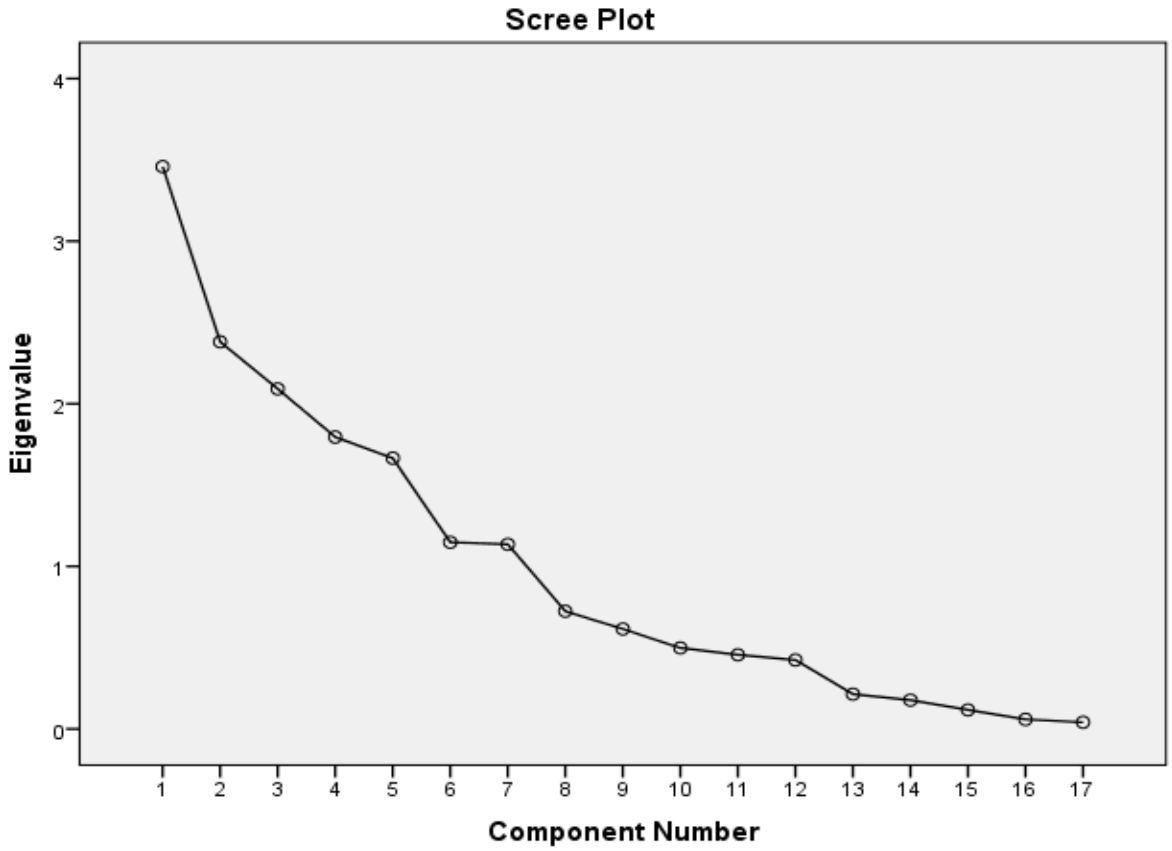

Figure 4.4.2: Scree Plot

The Scree Plot is a plot of factor Eigen values against the components number. According to Figure 4.4.1, we only consider 7 factors because the curve tends to flatten from the sixth component onwards, due to relatively low factor Eigen value.

4.4.2.4 Component Matrix

The table below shows the loadings of the 17 variables on the 7 factors extracted. The higher the absolute value of the loading, the more the factor contributes to the variable. A component matrix containing the Eigen values in respect to each factor was extracted from the factor analysis. The results are presented in Table 4.4.4.

Table 4.4.4: Factor Analysis (Component Matrix)

	Component						
	1	2	3	4	5	6	7
Poor planning for the digitization project	-.409	.566	.033	.188	-.433	-.076	.007
Lack of digitization standards	-.566	.476	.338	-.293	.019	.275	-.115
Poor technical expertise	-.567	.507	-.278	.196	-.242	.022	.219
Inadequate digitization facilities or infrastructure	-.049	.236	.428	-.595	-.021	.094	.283
Improper handling of original documents	.169	.563	-.459	-.027	.529	-.035	-.171
Inadequate staff in the project	.811	.107	-.117	-.167	-.088	.002	.329
Lack of high level management support	-.371	-.424	.339	.024	.593	-.142	.127
Lack of understanding of the importance digitization	.111	.588	-.505	.009	.503	-.176	-.161
Long procurement procedures for project resources	.860	.102	-.047	-.140	-.004	.102	.270
Inadequate funding	-.529	-.369	-.090	.305	.096	.429	.124
Poor sensitization of employees and users	.625	-.076	.136	-.139	-.391	-.050	-.286
Fast changing technology challenging preservation of digital content	.193	-.177	.459	.102	.308	-.165	-.499
Lack of Psychological preparation of the employees	-.147	.215	.230	-.740	.266	.292	-.063
Poor User interface	.285	-.043	-.251	.127	-.114	.743	-.448
Poor quality of digital content	.168	.515	.622	.504	.038	-.026	-.012
Lack of technical know how on project staff	.323	.006	.071	.402	.430	.367	.436
Poor preservation of the digital content	.359	.415	.611	.360	.019	.089	-.027

Extraction Method: Principal Component Analysis.
a. 7 components extracted.

Source: Researcher, 2013

The component matrix contains the relative Eigen values in respect of each factor. Each factor belongs to one of seven set of factors extracted, and is determined by the Eigen values of the factors to each set. Each number represents the correlation between the item and the unrotated factor .The unrotated component matrix indicates the correlation of each practice with the extracted factors. The correlations help in interpreting the underlying factors.

4.4.2.5 Rotated Component matrix

Rotation component matrix is used to reduce the number factors on which the variables under investigation have high loadings. Rotation does not actually change anything but makes the interpretation of the analysis easier. Factors were rotated using varimax method. Results are presented in Table 4.4.5.

Table 4.4.5: Factor Analysis (Rotated Component Matrix)

	Component						
	1	2	3	4	5	6	7
Poor planning for the digitization project	-.235	.306	.700	.012	.037	-.273	-.039
Lack of digitization standards	-.451	.218	.292	.048	.697	-.097	.063
Poor technical expertise	-.319	.015	.817	.161	.000	.022	-.070
Inadequate digitization facilities or infrastructure	.186	.071	.061	-.163	.751	-.020	-.223
Improper handling of original documents	.090	.012	.037	.919	.041	.061	.084
Inadequate staff in the project	.900	.017	-.048	.072	-.025	.095	.017
Lack of high level management support	-.490	-.052	-.479	-.096	.103	.370	-.438
Lack of understanding of the importance digitization	.054	-.002	.096	.953	-.036	-.006	-.024

Long procurement procedures for project resources	.884	.093	-.144	.089	.013	.157	.104
Inadequate funding	-.556	-.216	.102	-.264	-.111	.487	.201
Poor sensitization of employees and users	.535	.143	-.243	-.200	-.084	-.436	.259
Fast changing technology challenging preservation of digital content	-.165	.374	-.675	.024	-.042	-.190	.009
Lack of Psychological preparation of the employees	-.037	-.123	-.141	.134	.878	-.034	.058
Poor User interface	.076	-.022	-.074	.044	-.064	.076	.951
Poor quality of digital content	.007	.960	.068	.031	-.013	.070	-.070
Lack of technical know how on project staff	.220	.267	-.101	.093	-.110	.790	.067
Poor preservation of the digital content	.190	.872	-.058	-.025	.059	.076	.055
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.							
a. Rotation converged in 7 iterations.							

Source: Researcher, 2013

Table 4.4.5 presents the rotated component matrix. Varimax method of rotation was used which provided a solution where each factor had a small number of large loadings and a large number of zero (or small) loadings. This simplifies the interpretation because, after a varimax rotation, each original variable tends to be associated with one (or a small number) of factors, and each factor represents only a small number of variables. In addition, the factors can often be interpreted from the opposition of few variables with positive loadings to few variables with negative loadings. For example in table 4.4.5, the component 'Poor planning for the digitization project' was in factor 3 with a correlation of 0.7.

4.4.2.6 Factor Isolation

This involved isolating each of the variables and grouping them by these 7 extracted factors. Table 4.4.6 presents the factors with a minimum correlation of 0.4.

Table 4.4.6: Isolation of factors

Factor group	Challenges
Factor 1	• Inadequate staff in the project • Long procurement procedures for project resources Lack of understanding of the importance digitization • Poor sensitization of employees and users
Factor 2	• Poor quality of digital content • Poor preservation of the digital content • Poor quality of digital content
Factor 3	• Poor planning for the digitization project • Poor technical expertise
Factor 4	• Improper handling of original documents
Factor 5	• Lack of digitization standards • Inadequate digitization facilities or infrastructure • Lack of Psychological preparation of the employees
Factor 6	• Inadequate funding • Lack of technical know how on project staff
Factor 7	• Poor User interface

Source: Researcher, 2013

There were seven extracted factors to group the challenges in digitization. Factor 1 included having inadequate staff in the project, long procurement procedures for project resources, lack of understanding of the importance digitization and poor sensitization of employees and users. The first factor can be called "relating to departments" because all items in this group load highly on it. Factor 2 included poor quality of digital content, poor preservation of the digital content and poor quality of digital content. Factor 2 can be called “Digital content” as all the challenges in this group relate to digital content. Factor 3 included poor planning for the digitization project and poor technical expertise.

Factor 4 included improper handling of original documents while factor 5 consisted of lack of digitization standards, inadequate digitization facilities or infrastructure and lack of psychological preparation of the employees. Factor 5 can be called lack of digitization standards". Factor 6 consisted of inadequate funding and lack of technical know-how on project staff while factor 7 consisted of poor user interface.

4.5 Strategies in Digitization

The study has an objective of establishing the strategies that can be applied for successful digitization in the Kenyan Government.

4.5.1 Descriptive Statistics for Strategies in Digitization

Respondents were required to indicate the extent to which the department had applied each of the indicated strategies in order to enhance success of digitization project. The rating that was used was 1- No extent, 2 – Small extent, 3 – Moderate extent, 4 – Great extent and 5 – Very great extent. Responses were analyzed through mean scores. Mean scores were interpreted as follows: 1- 1.5 as No extent; 1.5 – 2.5 as Small extent; 2.5 – 3.5 as Moderate extent; 3.5 – 4.5 as Great extent and above 4.5 as Very great extent. A standard deviation of more than 1 indicates a great variation in the response meaning respondents did not have a consensus on their views, while a standard deviation on less than 1 indicates a less variation in the responses meaning respondents had consensus on their views. The results from the analysis are presented in Table 4.5.1.

Table 4.5.1: Strategies in Digitization

Strategies	Mean Score	Std Deviation
Policy enactment before digitization starts	4.26	0.86
Policy approval before implementation starts	2.84	1.31
Planning, monitoring and effective budgeting	3.97	0.96
Acquisition of appropriate technology in time	4.42	1.02
Sensitization, psychological preparation and retraining of staff	2.75	0.84
Collaboration with other departments and stakeholders	3.07	0.59
Standardization of quality and copyright	4.31	1.04
User orientation	2.76	1.31
Training project staff and public servants	2.93	0.95
Creating the information infrastructure at government and institutional level	3.29	1.08
Continuity of digital collection	4.03	0.84
Consulting successful government departments or experts	2.82	1.02
Having digital and quality standards	4.23	0.96
Documenting standards and best practices to be applied uniformly	3.94	0.89
Providing links to already digitized content	2.19	1.06
Trial testing	2.38	1.24

Source: Researcher, 2013

Study findings presented in Table 4.5.1 reveal that the major strategies applied to a great extent to counter challenges in digitization included acquisition of appropriate technology in time (4.42), standardization of quality and copyright (4.31) and policy enactment before digitization starts (4.26). Other strategies applied to a great extent in the digitization projects in government included having digital and quality standards (4.23), ensuring continuity of digital collection (4.03) and challenges in planning, monitoring and effective budgeting (3.97). Another strategy applied in digitization in government to a great extent was documenting standards and best practices to be applied uniformly (3.94). The strategies with standard deviation of more than 1

indicate that respondents had no consensus while less than 1 indicate there was consensus.

4.5.2 Factor Analysis

Factor analysis was performed to establish the major factors in the strategies applied to cater for challenges in digitization. The results are presented in this section where communalities, factor extraction, unrotated and rotated component matrixes are presented. The scree plot and isolation of factors are also presented.

4.5.2.1 Communalities

Communality matrix was extracted from the factor analysis. The proportion of variance that is unique to each item is then the respective item's total variance minus the communality. Table 4.5.2 shows how much of the variance in the variables has been accounted for by the extracted factors. Communality is the proportion of variance that each item has in common with other items. Communalities are presented in Table 4.5.2.

Table 4.5.11: Factor Analysis (Communalities)

	Initial	Extraction
Policy enactment before digitization starts	1.000	.734
Policy approval before implementation starts	1.000	.641
Planning, monitoring and effective budgeting	1.000	.947
Acquisition of appropriate technology in time	1.000	.543
Sensitization, psychological preparation and retraining of staff	1.000	.892
Collaboration with other departments and stakeholders	1.000	.836
Standardization of quality and copyright	1.000	.333
User orientation	1.000	.916
Training project staff and public servants	1.000	.556
Creating the information infrastructure at government and institutional level	1.000	.765
Continuity of digital collection	1.000	.649
Consulting successful government departments or experts	1.000	.695

Having digital and quality standards	1.000	.774
Documenting standards and best practices to be applied uniformly	1.000	.762
Providing links to already digitized content	1.000	.947
Trial testing	1.000	.697
Extraction Method: Principal Component Analysis.		

Source: Researcher, 2013

Results presented in Table 4.5.2 on communalities reveal how much of the variance in each of the original variables is explained by the extracted factors. The only variable with less than 50% of its variance being explained by the extracted factors 'Standardization of quality and copyright' with only 33.3% of its variance explained. This is therefore excluded from the analysis.

4.5.2.2 Factor Extraction

Table 4.5.3 shows all the factors extractable from the analysis along with their eigenvalues, the percent of variance attributable to each factor, and the cumulative variance of the factor and the previous factors. Factors were extracted using principal factor analysis with 5 factors being extracted as indicated in Table 4.5.3.

Table 4.5.3: Factor Extraction (Total Variance Explained)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.633	22.705	22.705	3.633	22.705	22.705
2	3.188	19.927	42.633	3.188	19.927	42.633
3	2.022	12.639	55.271	2.022	12.639	55.271
4	1.606	10.035	65.306	1.606	10.035	65.306
5	1.237	7.734	73.040	1.237	7.734	73.040
6	.935	5.841	78.881			
7	.852	5.322	84.204			
8	.632	3.949	88.152			
9	.558	3.488	91.641			
10	.470	2.940	94.581			

11	.428	2.675	97.256			
12	.185	1.154	98.410			
13	.146	.912	99.322			
14	.103	.645	99.968			
15	.005	.032	100.000			
16	1.398E-016	8.740E-016	100.000			

Source: Researcher, 2013

According to results presented in Table 4.5.3 indicate that 5 factors were extracted from the different strategies. The table presents total variance of all the factors. Principal component analysis was used to extract factors which totaled to 16. Eigen values indicate the relative importance of each factor accounting for a particular set and hence those with small Eigen value were left out. According to Table 4.5.3, only 5 factors were significant for the analysis. From table 4.5.3 we notice that the first factor accounts for 22.7.5% of the variance and the last factor accounts for 7.734% of the total variance. All the remaining factors are not significant.

4.5.2.3 Scree Plot

A Scree plot which is a plot of the factor eigen values against the component numbers. The Scree Plot in Figure 4.5.1 shows the factors that were extracted by indicating an elbow in the graph. In this case, 5 factors were extracted.

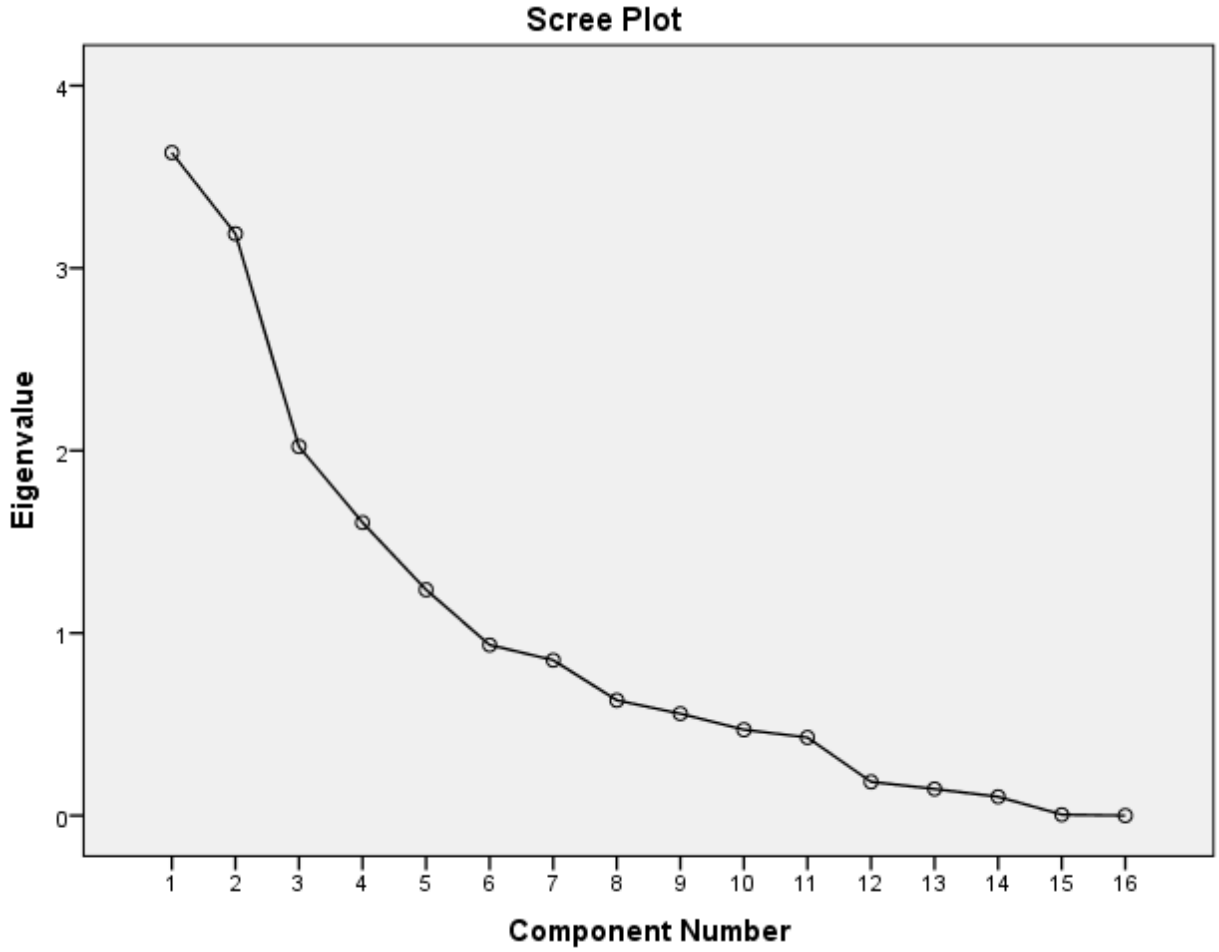

Figure 4.5.3: Scree Plot

Study results presented in the Scree plot show that we only consider five factors because the curve tends to flatten from the fifth component onwards, due to relatively low Eigen value.

4.5.2.4 Component matrix

The table below shows the loadings of the sixteen variables on the five factors extracted. The higher the absolute value of the loading, the more the factor contributes to the variable. A component matrix containing the eigen values in respect to each strategy was extracted from the factor analysis. The results are presented in Table 4.5.4.

Table 4.5.4: Factor Analysis (Component Matrix)

	Component				
	1	2	3	4	5
Policy enactment before digitization starts	-.013	-.578	.483	.406	.034
Policy approval before implementation starts	.479	-.521	-.357	-.083	-.076
Planning, monitoring and effective budgeting	.800	.543	-.041	.078	-.066
Acquisition of appropriate technology in time	.064	-.413	.152	.378	.449
Sensitization, psychological preparation and retraining of staff	.850	-.350	.181	-.029	.121
Collaboration with other departments and stakeholders	-.124	.445	.697	-.326	.176
Standardization of quality and copyright	.079	-.459	-.211	.261	-.058
User orientation	.868	-.361	.128	-.004	.127
Training project staff and public servants	.235	.459	.328	.391	.174
Creating the information infrastructure at government and institutional level	-.053	.002	.342	-.779	.197
Continuity of digital collection	-.125	-.111	.698	.315	-.187
Consulting successful government departments or experts	.590	.439	.045	-.053	-.386
Having digital and quality standards	-.221	.459	-.569	.218	.377
Documenting standards and best practices to be applied uniformly	.388	-.499	-.134	-.404	.426
Providing links to already digitized content	.800	.543	-.041	.078	-.066
Trial testing	.031	.534	.008	.178	.615
Extraction Method: Principal Component Analysis.					
a. 5 components extracted.					

Source: Researcher, 2013

The component matrix contains the relative Eigen values in respect of each factor. Each factor belongs to one of five set of factors extracted, and is determined by the Eigen values of the factors to each set. Each number represents the correlation between the item and the unrotated factor .The unrotated component matrix indicates the correlation of each practice with the extracted factors. The correlations help in interpreting the underlying factors.

4.5.2.5 Rotated Component matrix

Rotation component matrix is used to reduce the number factors on which the variables under investigation have high loadings. Rotation does not actually change anything but makes the interpretation of the analysis easier. Factors were rotated using varimax method. Results are presented in Table 4.5.5

Table 4.5.5: Factor Analysis (Rotated Component Matrix)

	Component				
	1	2	3	4	5
Policy enactment before digitization starts	-.267	.221	.758	-.196	-.033
Policy approval before implementation starts	.064	.600	-.154	-.393	-.315
Planning, monitoring and effective budgeting	.925	.175	-.128	.008	.210
Acquisition of appropriate technology in time	-.289	.369	.379	-.236	.352
Sensitization, psychological preparation and retraining of staff	.405	.813	.245	-.060	-.058
Collaboration with other departments and stakeholders	.102	-.180	.252	.833	.188
Standardization of quality and copyright	-.161	.220	.101	-.483	-.125
User orientation	.409	.829	.217	-.113	-.048
Training project staff and public servants	.430	-.130	.305	.081	.505
Creating the information infrastructure at government and institutional level	-.169	.244	-.125	.793	-.181
Continuity of digital collection	-.011	-.189	.772	.119	-.052
Consulting successful government departments or experts	.816	-.011	-.059	.072	-.145
Having digital and quality standards	-.057	-.290	-.544	-.225	.583
Documenting standards and best practices to be applied uniformly	-.189	.824	-.197	.082	-.046
Providing links to already digitized content	.925	.175	-.128	.008	.210
Trial testing	.121	-.059	-.138	.183	.791
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.					
a. Rotation converged in 8 iterations.					

Source: Researcher, 2013

Table 4.5.5 presents the rotated component matrix. Varimax method of rotation was used which provided a solution where each factor had a small number of large loadings and a large number of zero (or small) loadings. This simplified the interpretation because, after a varimax rotation, each original variable tends to be associated with one (or a small number) of factors, and each factor represents only a small number of variables. For example in Table 4.5.5, the component 'Policy enactment before digitization starts' was in factor 3 with a correlation of 0.758.

4.5.2.6 Factor Isolation

This involved isolating each of the variables and grouping them by these 5 extracted factors. Table 4.5.6 presents the factors

Table 4.5.6: Isolation of factors

Factor group	**Strategies**
Factor 1	• Planning, monitoring and effective budgeting • Sensitization, psychological preparation and retraining of staff] • User orientation • Training project staff and public servants • Consulting successful government departments or experts • Providing links to already digitized content
Factor 2	• Policy approval before implementation starts • Sensitization, psychological preparation and retraining of staff • User orientation • Documenting standards and best practices to be applied uniformly
Factor 3	• Policy enactment before digitization starts

	• Continuity of digital collection
Factor 4	• Collaboration with other departments and stakeholders • Creating the information infrastructure at government and institutional level
Factor 5	• Training project staff and public servants • Having digital and quality standards • Trial testing

Source: Researcher, 2013

Table 4.5.6 presents the variables in the five factors extracted. Factor 1 included variables such as planning, monitoring and effective budgeting and sensitization, psychological preparation and retraining of staff. It also contained strategies such as user orientation, training project staff and public servants and consulting successful government departments or experts. The factor also contained the strategy of providing links to already digitized content. Factor one can be called “planning, monitoring and effective budgeting”.

Factor 2 contains strategies such as policy approval before implementation starts and sensitization, psychological preparation and retraining of staff. Factor 2 also contains user orientation and documenting standards and best practices to be applied uniformly. Factor 3 contained strategies such as continuity of digital collection and policy enactment before digitization starts and this group can be called “policy enactment”. Factor 4 contained collaboration with other departments and stakeholders and creating the information infrastructure at government and institutional level. Factor 4 can be named “collaboration”. Factor 5 included training project staff and public servants, having digital and quality standards and trial testing. Factor 5 can be called “training” all strategies in group five relate to training.

CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This Section provides the summary of findings, conclusions and recommendations that are made in the study after considering the study findings. The objective of study was to establish the practices, challenges and strategies in Digitization projects in the Kenyan Government.

5.2 Summary of Findings

5.2.1 Demographic Information

This section provides a summary of the major study findings. Study results indicate that some of the studied digitization projects were funded wholly by the department, others were funded from external sources while the rest were jointly funded by the department and grant awarding agencies. Regarding the time the digitization projects started, results revealed that earliest digitization projects started in 2009 while the latest started in 2013.

Results regarding stage of completion of the digitization projects revealed that some of the digitization projects were fully completed with some being less than 25% completed. Regarding the personnel that were undertaking the digitization, results reveal that most of the digitization projects were undertaken by the departmental staff in conjunction with consultants. A few of the projects were undertaken by consultants only while the rest were undertaken by the client department. Study findings

established that most of the digitization projects were digitizing documents with a few digitizing images.

5.2.2 Practices in Digitization

The study had an objective to establish the practices involved in the digitization projects undertaken by departments and agencies in the Kenyan government. Study results indicated that practices that were followed to a very great extent in the digitization projects included quality assurance and quality control of metadata, management of archival information package (content preservation), image processing, project naming and file organization and specifying the need for creating the digital collection. Practices that were involved to a great extent included quality review of digital copies and collection, creation, management, and reuse in other systems of all types of metadata. Other practices involved to a great extent included technical verification of digital objects to technical standards and provision of access to dissemination information package to end-users. Factor analysis established six major practices that need to be observed. These include digitization project planning, selecting source material for digitization, preparation for digitization, handling originals, the digitization process itself and preservation of digital material.

5.2.3 Challenges in Digitization

Regarding challenges in digitization in government, study results revealed that challenges that affected most digitization projects in the government to a great extent included inadequate staffing in the project and improper handling of original documents. Other challenges that affected digitization projects to a great extent included long procurement procedures for project resources, inadequate digitization facilities or infrastructure, lack of understanding of the importance digitization and lack of technical knowhow on project staff. Study results also revealed that poor

quality of digital content and poor technical expertise were other challenges that affected the digitization projects to a great extent. Results from factor analysis indicate that seven challenges were established from the responses. The first challenge was poor planning and standards establishment. Other challenges included poor management of the digitization process, inadequate financial and technical resources and poor quality of digitization output and poor preservation.

5.2.4 Strategies in Digitization

On the strategies applied to deal with challenges, study findings indicate that strategies applied to a great extent included acquisition of appropriate technology in time, standardization of quality and copyright and policy enactment before digitization starts. Other strategies applied to a great extent include having digital and quality standards, ensuring continuity of digital collection and challenges in planning, monitoring and effective budgeting. Another strategy applied to a great extent in government digitization included documenting standards and best practices to be applied uniformly. Factor analysis revealed that there were five major strategies that were applied in government digitization projects. These were having a clear plan and digitization standards, good preparedness before project commencement, ensuring staff, project team and all users are sensitized and have requisite skills and ensuring that the output is useful and incorporated to ensure good service delivery.

5.3 Conclusions

From the study findings, the following conclusions are made. First, digitization in government follows some of the best practices in digitization including quality assurance and quality control of metadata, content preservation, specifying the need for creating the digital collection and quality review of digital copies. However, there

are some important practices that are not involved to a great extent in the digitization projects in government which may compromise the success of the projects. These include project assessment, evaluation and reporting, evaluation of physical condition of records and readiness for scanning, setting digital copy status and records management standards and setting up the necessary technical infrastructure and expertise.

Secondly, the study concludes that financial constraint is one of the major barriers for government digitization in Kenya. Other challenges that are faced in digitization include inadequate personnel in the projects, poor handling of original documents and material and inadequate resources and infrastructure for digitization. Technical know-how of project staff and procurement procedures are other challenges which hinder effective digitization in government.

Lastly, various departments in Kenya undertaking digitization projects have devised strategies which have enabled them to cope with some of the challenges faced. Some of the workable strategies include documenting standards and best practices to be applied uniformly. Another strategy applied is planning, monitoring and effective budgeting in the project. Some projects also have devised digital and quality standards and have policy enactment before digitization starts.

5.4 Recommendations of the Study

From the study findings, the following recommendations are made regarding digitization in government. First, the government departments should ensure that proper planning and budgeting is done even before the project starts. Successful

projects should include careful planning before implementing a digitization initiative. This planning should consider how digitization fits into government's overall vision, technology plan, and project workflows. Departments that are planning to have digitization projects should be encouraged to ensure that enough resources, funding and personnel are procured for the project during the planning phase.

Secondly, every department engaged in digitization should ensure a consistent, high level of image quality across collections. This should be followed by first considering the nature of the material to be digitized as well as the end use of the digitized resource. The source material should then be digitized at the highest appropriate resolution based on these factors. Further, if resources and project objectives allow, a master image file should be created and stored which can be used to produce derivative image files and serve a variety of current and future user needs. The digitization should be at an appropriate level of quality to avoid recapture and re-handling of the originals in the future.

Third, all digitization projects in government should decrease the likelihood of re-digitizing in the future by promoting best practices for conversion of materials into digital format and the long-term preservation of these digital resources. Because technology and industry standards are constantly improving and changing, the technical personnel involved in the process should ensure that content is usable even after technology changes. Government should increase the interoperability and accessibility of digital collections across the user departments and agencies and also the public through the use of widely accepted standards and formats.

5.5 Limitations of the Study

The study faced challenges of timely responses from the participants. Most respondents required a lot of persistence and reminding from the researcher to respond to the questionnaires. There were also cases of some respondents misplacing the questionnaire forms which necessitated the researcher to provide them with replacement copies of the questionnaire. However, the researcher was able to cope with this limitation by communicating with potential respondents and offering the motivation required to respond to the questionnaires.

The study also could have been faced with the possibility of bias in the responses since it focused on senior project officers in the digitization projects. This may have been due to the need to make the implementation of the project to look good. However, the researcher expressly indicated to the respondents that objectivity of the responses was important and there was need to respond truthfully. Respondents were informed that the findings could be used as a basis for making improvements in future digitization projects.

5.6 Suggestions for Future Research

This study established the established the practices involved in the digitization projects undertaken by departments in the Kenyan Government. The study further determined the challenges that are faced in digitization in the Kenyan Government and established the strategies that can be applied for successful digitization in the Kenyan Government. This study was a survey of government departments and agencies that have digitized or are in the process of digitization. For future research in this area, a case study approach may be adopted where in-depth data on the practices,

challenges and strategies can be sought. This study could apply an interview method of data collection to delve deeper in the digitization projects taking place in government.

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APPENDIXES

Appendix I: Questionnaire to Digitization Project Leaders in Government Departments

This Questionnaire is aimed at collecting data regarding practices, challenges and strategies in the digitization project. Your department has been selected to participate in this survey.

Please give responses to all the questions by filling or ticking in the appropriate spaces in the questionnaire.

SECTION A: GENERAL INFORMATION

1. What is your gender?

   Male……. . [ ]

   Female…….. [ ]

2. What is your age bracket in years?

   18 – 25 ……. [ ]
   26 – 30…….. [ ]
   31 – 35…….. [ ]
   36 – 40…….. [ ]
   41 – 45…….. [ ]
   46 – 50…….. [ ]
   Above 50 … . [ ]

3. Is your education IT related?

   Yes [ ]
   No [ ]

4. What is your job title in this digitization project? _____

5. How many years have you worked in this department? _____ years.

6. How is the project funded? You may tick more than one.

   Department…….[ ]
   External sources….....[ ]
   Grant awarding agencies……[ ]

   Othersspecify_____

7. When did digitization start in this department? _____

8. At what stage is your digitization project?

   Less than 25% ……[ ]

25% complete…….[ ]

50% complete…….[ ]

75% complete…….[ ]

100% complete ……..[ ]

9. Who is undertaking the digitization?

IT department staff… [ ]

Vendor/consultant…..[ ]

10. What is your organization digitizing?

Data ……[ ]

Documents …….[ ]

Others specify

_____

_____

11. Name the data/documents your organization is digitizing?

_____

___

SECTION B: PRACTICES IN THE DIGITIZATION

1. Indicate the extent to which each of the following practice is applied in the digitization project in your department. Use the following rating: Tick appropriately.

1- No extent 2 – Small extent 3 – Moderate extent

4 – Great extent 5 – Very great extent

	Practices	**1**	**2**	**3**	**4**	**5**
1.	Specifying the need for creating the digital collection					
2.	Policy enactment					
3.	Policy Approval					
4.	Planning, budgeting and monitoring					
5.	Selection of activities and processes					
6.	Assessment of activities and processes					
7.	Prioritization of activities and processes					

8.	Communication and coordination of digitization project					
9.	Setting up the necessary technical infrastructure and expertise.					
10	Selecting of equipment and components					
11	Planning on how to track records throughout the process					
12	Setting digital copy status and records management standards					
13	Definition of essential characteristics by defining legal admissibility/authenticity of digital copies of records, if applicable					
14	Evaluation of physical condition of records and readiness for scanning					
15	Determination of format to be used in workflow and systems standardization					
16	Selection of documents/material for digitization					
17	Preparation for digitization (hardware; software; environment)					
18	Moving original materials					
19	Manipulating original materials					
20	Scanning of the materials					
21	Metadata preparation					
22	Collection, creation, management, and reuse in other systems of all types of metadata					
23	Quality assurance and quality control of metadata					
24	Validation and verification of metadata					
25	Image processing					
26	Digital reformatting					
27	Quality management, quality assurance and quality control of digital copies					
28	Technical verification of digital objects to technical standards					

29	Quality Review of digital copies					
30	Project naming and file organization					
31	Submission of digital resources to delivery systems and digital repository					
32	Linking the digital repository to all appropriate IT systems					
33	Staff training					
34	Management of archival information package (content preservation)					
35	Provision of access to dissemination information package to end-users					
36	Project assessment, evaluation and reporting					
	Other (Specify and rate accordingly)					

SECTION C: CHALLENGES IN THE DIGITIZATION PROJECT

1. Indicate the extent to which the department has encountered each of the listed challenges in digitization. Use the following rating. Tick appropriately

   1- No extent 2 – Small extent 3 – Moderate extent

   4 – Great extent 5 – Very great extent

	Challenges	1	2	3	4	5
1.	Poor planning for the digitization project					
2.	Lack of digitization standards					
3.	Poor technical expertise					
4.	Inadequate digitization facilities or infrastructure					
5.	Improper handling of original documents					
6.	Inadequate staff in the project					
7.	Lack of high level management support					
8.	Lack of understanding of the importance digitization					
9.	Long procurement procedures for project resources					
10	Inadequate funding					

11	Poor sensitization of employees and users					
12	Fast changing technology challenging preservation of digital content					
13	Lack of Psychological preparation of the employees					
14	Poor User interface					
15	Poor quality of digital content					
16	Lack of technical know how on project staff					
17	Poor preservation of the digital content					
	Other (Specify and rate accordingly)					

SECTION D: STRATEGIES IN DIGITIZATION

1. State the extent to which the department has applied each of the following strategies in order to enhance success of digitization project. Use the following rating. Tick appropriately

   1- No extent 2 – Small extent 3 – Moderate extent

   4 – Great extent 5 – Very great extent

	Strategies	1	2	3	4	5
18. 1.	Policy enactment before digitization starts					
19. 2.	Policy approval before implementation starts					
20.	Planning, monitoring and effective budgeting					
21.	Acquisition of appropriate technology in time					
22.	Sensitization, psychological preparation and retraining of staff					
23.	Collaboration with other departments and stakeholders					
24.	Standardization of quality and copyright					
25.	User orientation					
26.	Training project staff and public servants					
27.	Creating the information infrastructure at government and institutional level					

28.	Continuity of digital collection					
29.	Consulting successful government departments or experts					
30.	Having digital and quality standards					
31.	Documenting standards and best practices to be applied uniformly					
32.	Providing links to already digitized content					
33.	Trial testing					
	Other (Specify and rate accordingly					

2. Please air your views on how digitization practices can be improved in this department for successful digitization

……
…..……
……
……
……

3. Please air your views on how digitization strategies can be enhanced for successful digitization

……
…..……
……
……
……

Thank you for your responses in this questionnaire

Appendix II: List of Ministries and departments in Kenya

1. Ministry of Interior and Coordination of National Government.
    i) Immigration
    ii) National Registration Bureau
    iii) Civil Registration
    iv) Refugee Affairs
    v) Population Registration Services
2. Ministry of Devolution and Planning.
    i) Macro planning
    ii) Monitoring and Evaluation
    iii) Rural Planning
    iv) Sectoral Planning
    v) Specialized Units
3. Defence
    i) Army
    ii) Airforce
    iii) Navy
4. Foreign Affairs
    i) Foreign Relations
    ii) Trade and economic relations
    iii) Treaties and international law
5. Education
    i) Basic Education
    ii) Secondary Education
    iii) Adult & Continuing Education
    iv) Quality Assurance & Standards
    v) Policy, Partneship & EAC
    vi) Field services
    vii) Science and technology
6. The National Treasury.
    i) Public procurement
    ii) Budgetary supplies
    iii) External resources
    iv) Accountant general
    v) Pensions
    vi) Economic affairs
    vii) Debt management
    viii) Government investment
    ix) Government clearance
7. Health.
    i) Family Health services
    ii) Disease Control
    iii) Radiation Protection
    iv) Primary Healthcare services
    v) Environmental Health and sanitation
    vi) Health Promotion
    vii) Technical Planning and Performance
    viii) Monitoring
    ix) Disaster management and preparedness
    x) International Health relations

8. Transport and Infrastructure
    i) Transport Services
    ii) Infrastructure.
9. Environment, Water and Natural Resource.
    i) Environment
    ii) Resource Surveys and Remote Sensing
    iii) Meteorology
    iv) Water and Natural Resources
10. Land, Housing and Urban Development
    i) Lands
    ii) Land adjudication and settlement
    iii) Surveys
    iv) Physical planning
    v) Housing
    vi) Urban Development
11. Information, Communication and Technology (ICT)
    i) Licensing
    ii) Communications
    iii) Information technology
12. Sports, Culture and the Arts.
    i) Sports
    ii) Culture and heritage
    iii) Arts
13. Labour, Social Security and Services.
    i) Labour
    ii) Social Security
14. Agriculture, Livestock and Fisheries
    i) Agriculture,
    ii) Livestock
    iii) Fisheries.
15. Industrialization and Enterprise Development.
    i) Industrialization
    ii) Enterprise development
16. Commerce and Tourism
    i) Commerce
    ii) Tourism.
17. Mining
    i) Geology
    ii) Exploration
    iii) Mineral management.
18. Energy and Petroleum
    i) Petroleum energy
    ii) Renewable energy
    iii) Electrical Power development
    iv) Geo-exploration