A STRATEGIC FRAMEWORK FOR DIGITAL PRESERVATION CAPABILITY MATURITY READINESS IN THE CONTEXT OF E-GOVERNMENT IN THE PUBLIC SERVICE IN BOTSWANA

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ABSTRACT

This study assessed the digital preservation capability maturity readiness within the context of e-government in Botswana Public Service with a view to developing a strategic framework that ensures digital continuity. There some studies that have been conducted in Botswana regarding digital preservation but they did not provide a framework which could be used as an assessment to check their capability in digital preservation as e-government progresses so that digital information is continuously being used for decision making over time. The study adopted a pragmatic paradigm and embedded mixed method approach; whereby a cross sectional survey and case study were deployed in each of the 6 selected ministries as a unit of analysis. The target study respondents comprises of 5 Senior Managers, 4 Managers - Human Resources and Administration, 6 ICT Managers, 40 Records Management Officers,12 Information Technology Officers, 1 Performance Improvement Coordinator, 1 Project Manager, 8 Archivists, 1 Assistant Deputy Manager and 1 Deputy Managers-Management Services. The data was collected through interviews, questionnaires, personal observations, and documents analysis. Both qualitative and quantitative data were collected sequentially and simultaneously where one form of data supported or complemented each other so as to have one form of data play a supportive role to the other. Data analysis was achieved through the triangulation of both qualitative and quantitative data in order to yield a single interpretation and conclusion drawn. The findings of the study showed that the Botswana Public Service has no unified national information systems used to manage public sector records leading to some ministries adopting their own electronic records management systems. Currently few ministries have implemented the electronic records management system and majority of the digital records are not preserved due to lack of preservation guidelines and strategies. The study further established the lack of preservation policies and skills in managing and preserving digital records in Botswana Public Service. In that regard, the study developed a strategic framework for digital preservation capability maturity readiness in the context of e-government in the Botswana Public Sector. The ultimate aim of the framework is to ensure digital continuity and make sure that e-government is sustained for the benefit of an open government and increased participatory citizenry.

Keywords: Botswana Public Service, Digital Maturity Capability, Digital Continuity, Digital records, Digital Preservation, E-government.

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LIST OF ABBREVIATIONS

DPCMM: Digital Preservation Capability Maturity Model

DPSM: Department of Public Service Management

DPS: Digital Preservation System

EGDI: E-Government Development Index

HV: High-high-very high (Rating Class)

ICA: International Council on Archives

ICT: Information Communication Technology

IRMT: International Records Management Trust

ISO: International Standard Organisation

OAIS: Open Archival Information System

OECD: Organisation for Economic Co-operation and Development

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DECLARATION

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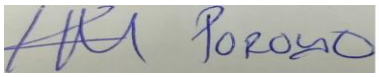
A Strategic Framework for Digital Preservation Capability Maturity Readiness in the context of e-Government in the Public Service in Botswana.

I declare that the above thesis is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the thesis to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.



SIGNATURE

20/04/2021

DATE

DEDICATION

I dedicate my thesis to my family and many friends. A special feeling of gratitude to my loving parents, Phentu Motlalekgosi and Phaki Boitumelo Porogo whose words of encouragement and push for tenacity ring in my ears. My brothers Koketso and Onkabetse, sisters Eliza, Rose, Dineo and Sarah have never left my side and are very special.

CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.1 Introduction to the Study

The efficient and effective management of e-records and advanced content is a cornerstone of every e-government operation in any country in today's computerised world. The benefits of using Information and Communication Technologies (ICTs) in the public sector are manifold. E-government is one of the essential tools that acts as an enabler in the effective facilitation and coordination of information as well as effective public service delivery across the government (Bwalya 2018a). This suggests that there ought to be public area re-designing whereby the special and nonexclusive cycles can oblige the administration of advanced information brought by new technologies.

Research reveals that as governments and businesses around the world adopt e-government methods, there would be rapid production and development of electronic records. The utilization of electronic records necessitated the development and prudent use of electronic records management systems (Nengomasha 2009; Kalusopa & Ngulube 2011; Tsabedze & Kalusopa 2018). The implementation of electronic records management systems is imperative given that the utilization of e-government applications results in a significant amount of advanced electronic content whose quality and reliability need to be maintained (Tsabedze & Kalusopa 2018). Bwalya (2018b:19) further observes that e-government enables the re-engineering of conventional government administration systems. This makes it easier to examine and modify systems with unnecessary rules and regulations that hamper effective service delivery resulting in a transformed, more efficient public service delivery capacity. It has been observed that as more governments are introducing e-government solutions, preservation of digital records has become a challenge. Digital record preservation is one of the vital areas in

records management in the sense that it ensures that digital records of proceeding with continuing value stays open and usable (ICA/IRMT 2016:110). Research has shown that preserving digital records involves protecting the ability to reproduce it (Duranti & Thibodeau 2006:19). The other reason considered paramount in digital record preservation is to safeguard continuous access despite changes in technology. A study by Katuu (2004) has shown that almost 60% of records are produced by the government sector in Africa. Asia, Caribbean and the Pacific also have a substantial amount of records in digital format emanating from e-government initiatives. Mnjama (2014) affirms that as governments implement e-government, appropriate measures need to be in place for e-records management.

According to Duranti & Thibodeau (2006:20) ICT's that maintain and preserve electronic records must locate the various components of a record and use the necessary software to replicate each component. This is because information technologies may contain all or part of a record as well as associated metadata. Since all or part of a record as well as related metadata may be contained in the digital components, the ICTs that maintain and safeguard electronic records must be efficient enough to locate the various components of a record. It should also have the ability to and apply the appropriate programming to each component to reproduce the records. An email with a textual message, an image, and a digital signature for example has at least four digital components: header data which allows systems to properly route and manage the message, message text, picture and digital signature.

Pederson (2016) showed that there are developing countries which have neglected to adequately carry out e-government leading to the high aptitude given the heterogeneity of innovation conditions in government organisations. In addition, Bwalya (2018a:v) expresses that with the fast progress in achieving e-government initiatives in Africa and throughout the entire world

there is a need to look at the key challenges likely to occur if e-records are not adequately preserved. E-government, for example helps to reduce corruption by encouraging openness, accountability and confidence. It also lowers the cost of providing public services while increasing their effectiveness.

Adu et al (2016) suggests that the connection between advanced preservation and e-government is consistently advantageous in light of the fact that viable and productive recordkeeping as per great practice offers significance to one side to data for the citizens. Essentially, as a drive toward e-government the utilisation of ICTs has prompted the making of tremendous measures of computerized information both inside general society and private area. However, this huge measure of computerised data can be overwhelming, provided that advanced records are more convoluted and sensitive than paper-based systems and subsequently compromise the future manageability of government data (Adu 2013:97). Depending on the maturity of e-government where it is applied all government services can be delivered online. That way more customers can be reached, served faster and make services available within 24 hours. For instance, the Canadian government has launched a new federal tech unit to spearhead a drive to develop what it hopes will be the world's best digital services.

In recent years, Botswana public service has implemented e-government systems as one of the programs used to transform the public sector with the aim of enhancing service delivery (Jauhari, Abd Majid, Basri, & Djalil, 2020). Adu et al (2016) posits that the relationship between digital preservation and e-government is always symbiotic because effective and efficient recordkeeping in accordance with good practice gives meaning to the right to information for the citizens. Essentially, as a drive toward e-government, the use of ICTs has led to the creation of huge amounts of digital data both within the public and private sector. However, this vast amount of digital information

can be daunting, given that digital records are more complicated and delicate than paper-based systems, and therefore threaten the future sustainability of government information (Adu 2013:97) . All the government services may be provided online depending on the maturity of e-government where it is implemented. The advantage that comes with online services is that services available within 24 hours. In addition to that customers can be reached, served efficiently within a reasonable time.

In recent years the government of Botswana has deployed e-government systems as one of the programmes employed to transform the public service with the aim of improving service delivery. According to Nkwe (2012) the Botswana government strategy in 2011 that outlined interrelated project aimed at moving all relevant government services online, dramatically improving public sector service delivery and accelerating ICT adoption and use across all segments of society. Samboma (2019:3) adds that the Botswana government has implemented several e-government projects that include National Identification System, e-passport, registration of land and property, government core services, business registration and licencing, the passport office, vehicle registration, national statistics (HR, finance, procurement, project management & knowledge management). Infact Botswana has registered improvements in all indicators on technological readiness and the country's path on the adoption ICTs in its governance process has been strengthened (Botswana 2019:4). Emerging evidence shows that in quarter 3, 2019, the ICT sector contributed P1334.5 million in current prices, which constituted 2.7 percent of total GDP. In real prices, the Postal and Communication Services Sector contributed P780.8 million to the economy and this stood at 3.1 percent of total GDP. This indeed shows a positive change towards a move the use of ICT's in Botswana.

Botswana has embarked on creating an enabling climate as far as e-government is concerned. Efforts are made for national digital connectivity and the related regulatory framework is improved. In order to facilitate the growth of all sectors in Botswana, the country has embarked on e-government usage activities which started with an e-preparation assessment in 2004; approval of the National ICT strategy in 2007, and the endorsement of the e-government framework in 2012, both of which are expected to be implemented in 2014 fiscal year. Botswana is a developing country with a committed agenda for advancing e-government, owing to the fact that its leaders recognise the value of e-government. The government portal through which public services, economic growth and e-democracy take place, is the most important aspect of e-government development (Phirinyane 2016:9). The Botswana government is making significant progress in improving e-government and public service. This is shown by studies such as the government all inclusive plan 2015- 2021. The government of Botswana's National Development Plan 11, which runs from April 2017 to March 2023 reflects that the enhancement of essential electronic facilities, internet access and postal network as well as the introduction of e-government initiatives will be prioritised. According to the National Development Plan 11, the development of e-services broadband connectivity as well as the implementation of e-government project will be prioritised. The Botswana e-government master plan 2015 to 2021 strategies are categorised into the core building blocks of e-government system which are the following:

- Improve information access by bridging the digital divide and increasing network speed. This can be accomplished through the creation of an integrated government portal, an e- education system, a national health information system, e-services and content and forms.

- Innovate Service Delivery through seamless connectivity between government agencies by implementing the following projects: network optimization System, e-document system, project evaluation system, local government information system and administration information sharing Centre.

- Provide meaningful opportunities through current and valid data geared towards integration of employment data of private and public sectors. The projects to be implemented are job portal and civil affairs single portal.

- Enhance competitiveness through economic diversification by implementing the following projects e-procurement system and business activity support system.

- Infrastructure by providing realistic and relevant technologies to support e-government program. The project includes: enterprise architecture, integrated data centre, step, contact centre, national broadband strategy. Policies and regulations, kitsong centres, governance and institutional framework, legislative framework and network optimization.

The above demonstrate that Botswana's government is committed to providing universal access to services by using effective methods and innovation for efficient and persuasive delivery.

According to Samboma (2019) Botswana's government has lost more than P 1 billion since implementing e-government program in 2012. As indicated by Kalusopa, Bayane and Mosweu (2017) government ICTs have infiltrated many, if not all of Botswana's public sector agencies, even if they do not always interact with archives and records management systems.

The government of Botswana has further demonstrated commitment to e-government by establishing a policy, legal and regulatory framework to ensure good governance. Evident to this is the existence of the ICT legislative instruments that regulate ICT in Botswana such as; The Communication Regulatory Authority Act of 2012, the Electronic Records (Evidence) Act of 2014, the Electronic Communication and Transactions Act of 2014, the National Information and Communication technology Policy (2007) as well as the Cybercrime and Computer Related Crime Act. The national ICT policy has since provided a roadmap as to what needs to be done to ensure development of the ICT sector and economic diversification drive (Botswana Government, 2007). From a policy standpoint, Botswana has clearly established a sound institutional and regulatory structure to ensure that e-government is properly incorporated into the socioeconomic hierarchy (Sebina 2016).

Botswana's public institutions maintain digital records using a hybrid manual electronic system, with room for change and a greater emphasis on digital records management (Kalusopa, Bayane & Mosweu 2017:20). The problem of digital preservation on the other hand continues to be a source of concern. The introduction of technology especially the use of social media is vital for a proper understanding of records preservation in future (Mosweu & Ngoepe 2018). In Botswana, as in other countries, the growing development of electronic records in the public sector has undoubtedly raised concerns among archivists, librarians and other custodians of such materials about the challenges of digital preservation (Kalusopa & Zulu 2009a).

According to the open data readiness report, Botswana has already digitised many of the important datasets for this effort, and the re-invigorated e-government strategy provides the opportunity to ensure that data from key systems can be easily extracted for publication of Open Data as and when the

Botswana government decides to do so (Government of Botswana, 2015). Despite this, there are challenges such as the reliability and accuracy of government documents, which are needed to support the transparency of government processes such as open and transparent tender bidding remain (Mutula 2008: Sebina & Zulu 2014). Kalusopa et.al (2007) observes that Botswana is still behind in enacting legislation that monitors the trustworthiness and operation of processes in the public sector.

According to Millar (n.d.) a physical document may not even exist with electronic records. Frequently, a 'record' is nothing more than a transient user view, a snapshot of certain data fields for a limited time. While certain systems structure records, some act as both a record source and a raw data source. Digital preservation has progressed to the point that it is evolving into a complex perspective known as digital continuity; with electronic documents, a tangible document may not exist at all. Digital preservation has progressed and evolved to the point that it is now a complex perspective known as digital continuity. To preserve an electronic archival record, there is need to first determine which pieces of data are or are not part of the actual record. Current studies such as the InterPARES Trust Project (2016) raised similar issues regarding the poor status of digital preservation without pointing to a clear framework for capability and maturity readiness in the public sector. In that regard, this particular study investigates the extent of the development and a usefulness of the strategic framework in understanding the digital preservation capability maturity readiness in the public service in Botswana.

Current studies have indicated that digital records are poorly preserved but they did not come up with a clear framework which showed that capability and maturity readiness in the public service (InterPARES Trust Project 2016). In this regard, the aim of this study is to determine the extent of the strategic framework development and utility in determining the digital preservation

capability maturity readiness in Botswana public service. It is imperative to have a framework that reflect that knowledge in the digital format is managed fervently over time despite any technological change in order to guarantee availability and utilisation in the Botswana Public Service. The ultimate aim is to ensure that there is digital continuity and e-government that is sustained for the benefit of an open government and increased participatory citizenry. Availability of such a framework ensures that the need for digital information is found, understood and trusted through change. It is worth remembering that digital records management and preservation must be a joint responsibility with the Botswana Public Service's awareness and support. This means that there is a need for active intervention from the time of creation throughout the digital record lifecycle to ensure that digital records do not lose continuity. A team made up of enterprise architects, project managers, electronic records managers, librarians and archivists should collectively work together to ensure digital records are managed properly using recent technologies, models, appropriate technologies that they are made available whenever needed for decision making.

1.2 Definition of key words

This section defines and clarifies the following main concepts as they relate to the study's context.

1.2.1 Digital record

According to ISO 14641 (2018) a digital record is a representation of content that is electronically recorded and maintained. It is linked to text, logic and display attributes that can be retrieved by a computer that can make human readable or machine – readable object.

1.2.2 Audit trail

This is a method of monitoring all communications with records within an electronic system so that any system access can be tracked as it happens in

order to avoid inappropriate actions with the records (The InterPARES Glossary, 2001:1).

1.2.3 Authenticity

The ISO 15489 -1 2016 in clause 7.2.2 standard, defines authenticity as follows:

An authentic record may be proved;

- to be what it purports to be,
- to have been created or sent by the individual purported to have created or sent it, and
- to have been created or sent at a time purported to have been created or sent.

1.2.4 Authentication

This is an evidence rule that decides whether or not an object put into evidence in legal case is genuine. This may also apply to a certificate of authenticity, in which the author or preserver of the documents declares authenticity of one or more copied or reproducible digital records (InterPARES 2007: 10). The only way to authenticate a document is to have a witness attest to its authenticity (ICA/IRMT 2004:5).

1.2.5 Digital preservation

In the Botswana Public Service, digital preservation has become a requirement and a problem, necessitating the continuous use of information for future use. Nayak and Singh (2014) describe digital preservation in two distinct ways, one being the digitisation of analogue materials as well as the preservation of digitally created materials. The other being the process that ensures that digital materials are preserved and protected them from physical deterioration and technical obsolescence.

Digital preservation is described by Kalusopa and Zulu (2009b:99) as a ‘series of adapting management activities required to ensure continued access to

digital materials'. For the purposes of this study, digital preservation involves storing digital records in secure locations for long periods of time and keeping them available and useable in the future.

1.2.6 Digital continuity

Information and Records Management Society (2014:) defines digital continuity as the ability to use digital information in the way that is needed, for as long as it is needed.

1.2.7 Digital repository

Is a framework for managing long-term digital artifacts, institutional repositories, on the other hand, are a form of data archive designated by an organisation for the preservation of digital artifacts created under its auspices (Altman 2008).

1.2.8 E-government

According to Romke (2013) e-government is the use of information and communication technologies (ICT'S) to encourage more efficient and effective government. E-government enables more transparency in provision of government services, increases public access to information and makes government more accountable to people.

1.2.9 Electronic signature

This is a digital signature that is attached to, or logically connected with, a document and used by a signatory to accept responsibility for or give consent to the content of the record (InterPARES Glossary 2001:1).

1.2.10 Integrity of a record

The Integrity of a record refers to its completeness and soundness: a record is complete and uncorrupted in all of its critical aspects (Duranti 2007).

1.2.11 Capability

Cambridge Dictionary (2018) defines capability as the ability to do something.

1.2.12 Trusted electronic systems

These are rules, tools and methods for making reliable and accurate records, maintaining and keeping authentic records (Xie 2013).

1.2.13 Trusted Digital Repository

This is an organisation whose goal is to provide its defined group with secure, long term access to controlled digital services, both now and in the future (An RLG-OCLC 2002).

1.2.14 Public Service

These are organisations which are 100% owned by the government within a country. For instance in Botswana all the Ministries and Departments are owned by the government that is therefore classified as Botswana Public Service (Wegrich, 2017).

1.3 Statement of the Problem

Evidence from literature points out that Botswana is actively pursuing e-government. However, challenges remain with regards to ensuring long-term digital content preservation so that digital records are permanently secured and protected for authenticity and potential access (Kalusopa & Zulu 2009; Kalusopa, Bayane & Mosweu 2017). This is so because the automation and re-engineering of systems and online resources, the preservation of digital records has become more difficult. Earlier studies (Keakopa 2007; Kalusopa, Bayane & Mosweu 2017; Kalusopa & Ngulube 2015) attempted to look at e-records and e-records readiness in government, industry, private and non-governmental sectors. However, the study did not explore e-government and digital preservation capability maturity in Botswana.

The World Bank Group uncovered that the Botswana National Archives Act of 2007 makes no specific arrangement for preservation and archiving of digital records the policy and strategy are structured around paper records. The earlier studies such as Kalusopa & Ngulube (2011) ; Kalusopa & Zulu

(2009b); Keakopa (2007); Kootshabe (2011); Moatlhodi (2015); Motupu & Kalusopa (2016); Mutula & Moloi (2007); Wamukoya & Mutula (2005 discuss preservation but do not propose any framework of assessing digital preservation maturity readiness in the public service. This study therefore assesses the e-government drive and digital preservation capability maturity. This current study develops and presents a framework that ensures permanent digital continuity. The framework requires Botswana Public Service to be active and oversee the management of digital records so that they permanently remain complete, available and useable whenever the need arises.

1.4 Aim of the study

The aim of the study is to evaluate the maturity of digital preservation capability in the context of e-government in Botswana Public Service in order to establish a strategic framework that ensures digital continuity.

1.5 Research objectives

The research objectives are as follows:

1. To assess the digital preservation infrastructure in terms of the policy, strategy, collaboration and technical expertise in the government ministries within the context of e-government.

2. To examine the trustworthiness of existing digital records in the Botswana government repositories in terms of accuracy, authenticity and reliability for effective e-government delivery.

3. To assess digital preservation strategies delivered as part of e-government.

4. To determine and compare at which stage each Ministry is in terms of digital preservation capability maturity readiness.

5. To propose an appropriate framework for the assessment of the digital maturity capability readiness in the Botswana public sector that can enhance e-government.

The relationship between research objectives, research questions and sources of data is shown in table 1.

Table 1: Research objectives, research questions and sources of data.

Objective	Research Question	Research Method	Sources Data
1. To assess the status of the digital infrastructure in terms of the policy, strategy, collaboration and technical expertise in the government ministries within the context of e-government?	How is the status of the digital infrastructure in terms of the policy, strategy, collaboration and technical expertise in the government Ministries within the context of e-government?	• Quantitative	• Closed ended Questionnaire

2. To examine the trustworthiness of existing digital records in the Botswana government repositories trustworthy in terms of accuracy, authenticity, reliability, security and access for effective e-government delivery.	To what extent are existing digital records in the Botswana government repositories trustworthy in terms of accuracy, authenticity and reliability for effective e-government delivery?	• Qualitative and Quantitative	• Open ended Questionnaire • Observations • Interviews
3. To assess digital preservation strategies delivered by Ministries in the context of e-government?	What level or stage are the Ministry or Departments at in digital preservation capability maturity readiness?	• Quantitative and Qualitative	• Closed ended Questionnaire • Interviews

4. To find out the level or stage are the Ministry or Departments at in digital preservation capability maturity readiness.	What level or stage are the Ministry or Departments at in digital preservation capability maturity readiness?	• Qualitative	• Interview • Open ended Questionnaire
5. To propose an appropriate framework for the assessment of the digital maturity capability readiness in the Botswana public sector that can enhance e-government delivery.	What is an appropriate framework for the assessment of the digital maturity capability readiness in the Botswana public sector that can enhance e-government delivery?	• Quantitative	• Closed ended questionnaire

1.6 Significance of the Study

In Botswana, only a few empirical research on management of digital records have been conducted (InterPARES Trust Project 2016; Sebina & Zulu 2014). This research adds to the body of knowledge in the field of digital preservation capability maturity readiness in Botswana's public service. As different governments guide various digital opportunities and related challenges, the structure suggested by the study will be useful in helping to

inform decision – making of procedure and policies in the Botswana Public Service, as well as similar sectors in Africa and beyond. In addition, all the observations and recommendations are essential to improvement and ensured digital continuity of electronic content in accordance with best international practice. The study is also applicable to stakeholders of scholarly information delivery, such as traditional and open access publishers, as well as the operations of dissemination portals, government officials, lawmakers, knowledge managers, students, researchers, learned societies, journal editions, archivists, data managers, records managers, funders and developers of preservation technologies.

1.7 Originality of the study

In Botswana, research has been conducted on information technology with particular reference to electronic records and as well as e-government (Bwalya 2018; Nkwe 2012; Motupu 2015 & Samboma 2019). Some focused on electronic records (Kalusopa, Mosweu & Bayane 2017; Mutula & Moloi 2007) and others focused on digital material preservation (Mnjama & Kootshabe; Zulu & Kalusopa 2014; Sebina & Zulu 2014). Recent studies such as Mosweu 2018 looked at liquid communication. These studies did not develop a framework which could be used to assess the Botswana Public Service digital preservation readiness of information so that it is accessible and can continuously be used for decision making, hence the need for this study.

Accordingly, this study was motivated by the fact that there is currently a paucity of empirical research, with specific reference to a strategic framework for digital preservation capability maturity readiness in the context of e-government in the public service in Botswana. The study will contribute knowledge to the void on digital preservation and e-government. This study is original in the sense that it focuses on developing a framework with focus on continued accessibility despite technological challenges such as obsolescence

and loss caused by errors in management. The main interest of the research lies on these aspect (continued accessibility) of digital records from creation to disposal. The proposed framework ensures that clear assessment of digital information becomes an integral part of e-government implementation.

1.8 Scope and delimitation of the Study

Scope means parameters under which the study will be operating and delimitations are those characteristics that arise from limitations in the scope of the study (Simon & Goes 2013:1). The study evaluated and examined the digital capability maturity readiness in the context of e-government in the public service in Botswana with the view to develop a framework for digital preservation of records so that they remain accessible, trustworthy and continuously be used now and in the future. The study was conducted in the Botswana Public Service which has adopted several e-government strategies to improve public service delivery. The study focused on Botswana Public Service and not parastatal nor private sector organisations. In terms of data collection, the respondents were civil service employees who were involved in the strategic management of records within the ministries. The reason for this particular preference was that, they had vast knowledge on e-government issues holistically. The results of this study will provide reliable information to researchers as it contributes significantly to digital records preservation in the institutions within the country.

1.9 Limitation of the study

Simon (2011: 2) defines limitations as possible weaknesses in a study that are beyond the control of the researcher such as time and sample. It was not possible for the researcher to cover the parastatals and private companies. However, the findings of this study could still serves as a useful benchmark for the six (6) Ministries sampled and surveyed out of a total of nine (9) ministries in Botswana. Future research conducted in this area could be more specific case studies focusing on the parastatal and private companies in order

to get a more detailed understanding of the digital maturity readiness in the context of e-government.

The researcher encountered several challenges in conducting this study. First and foremost, the researcher wanted to conduct a survey on (9) nine ministries but only six ministries and departments granted permission while the other three did not respond to the request. Further, some of the respondents did not complete the questionnaire despite several follow ups via phone and emails. Additionally, the interviewees kept on changing their schedules as the majority of them indicated that they were busy on official, local, and international trips.

1.10 Ethical considerations

According to Antwerpen (2020) there are two objectives in research ethics. Firstly it is to ensure participants that research is conducted in a way that serves the interests of individuals, groups and or society as a whole. The second objective is meant to inspect explicit examination exercises and projects for their moral sufficiency, taking into consideration issues such as the administration of any risk, protection of confidentiality and process of informed consent.

As stipulated in (UNISA, 2016) the following details are some of the ethical considerations or the rights and responsibilities of researchers at UNISA.

- In line with the UNISA policy on ethics in research, researchers have rights to academic freedom and freedom of scientific research.
- Researchers should be knowledgeable and to achieve the highest possible level of excellence, integrity and scientific quality in their research.
- Researchers should be honest in both their own research activities and their reactions to other researcher's actions. This extends to all aspects

of science including data collection and analysis, publication of findings and acknowledgement of direct and indirect contributions from colleagues, collaborators and others.

- Researchers should be straightforward in regard of their own behavior in research and in their reactions to the activities of different specialists. This applies to the entire research findings which need to be accurately be reported, published and preserved in the repositories to be used in future.
- Researchers should adhere to confidentiality by protecting the interest of co-researchers and participants when sharing the data in any form.

The researcher requested permission from each ministry (see appendix A). The respondents were informed that their confidentiality and their names will not be disclosed. The researcher adhered to research ethics policy and submitted herself to the ethical conduct guidelines by avoiding bad behavior such as misrepresentation and fraud.

1.11 Structure of the thesis/ dissertation

This section shows how the dissertation chapters are organized in this study. The thesis consists of seven (7) chapters as follows:

Chapter One: Introduction and background of the study

This chapter provides the introduction and background of the study. The chapter also covered the statement of the problem, the overall aim of the study, research purpose, objectives, research questions significance, definition of key terms, summary of research methodology and the structure of the thesis.

Chapter two: Location and context of the study

This chapter discussed the location and context of the study. It first discussed the location and context of the study. In addition, it conferred on the political history and socio-economic conditions of Botswana, scope and organisational

structure of the Botswana Public Service with the nexus of e-government and digital preservation in Botswana.

Chapter three: Literature review and theoretical framework

This section provides a discussion of the literature review and theoretical framework that guided this study. In addition, it discusses literature on trustworthiness of digital records in terms of accuracy, authenticity and reliability, trusted digital repositories, preservation policies, technical expertise, strategies, security and access.

Chapter four: Research methodology

The study's research methodology is described in this chapter. The research paradigm, research method, research design, sample population, sampling techniques, data collection procedures and data analysis are all examples.

Chapter five: Presentation and analysis of data

The study's main findings are presented in this chapter.

Chapter six: Discussion of the findings

The chapter provides interpretations and implications of the findings.

Chapter Seven: Summary, conclusions and recommendations

The findings, recommendations and research areas described in this chapter are summarised in this chapter. In addition, the model that is proposed is provided.

1.12 Summary of the chapter

This chapter provided an overview of the study's background as well as definitions of key terms in the context of their use throughout the study. Background information and definition of key terms are required to guide readers through the thesis topic and how various terms are used. The background setting of the study was also clearly outlined with a clear articulation of the statement of the problem. The chapter also discussed the motivation of the study, the aim and objectives, research questions, scope and

limitation of the study, brief information about the research methodology and ethical considerations. This chapter then outlines how this thesis is structured.

CHAPTER TWO

LOCATION AND CONTEXT OF THE STUDY

2.1 Introduction

This chapter discusses the location and context of the study by providing the political history, geographical, socio-economic conditions and study location in Botswana. It then gives the scope of Botswana Public Service, organisational structure and the nexus of e-government and digital preservation.

2.2 Political History and Geographical Location of Botswana

According to government of Botswana (2017) Botswana is a landlocked country covering an area of 582 000 square kilometers with a population of 2024904 (Government of Botswana 2017). Botswana lies in the centre of Southern Africa, bordered by Namibia to the west, South Africa to the south, and Zimbabwe to the north east. The country has a point of contact with Zambia as well as Namibia west of Kazungula (See figure 1.1). The country's climate is semi-arid with varied and uneven rainfall, extreme temperatures and forest land and savanna types. Botswana is also well endowed with natural resources especially diamonds which have been the main support of the economy's source of revenue for decades (Government of Botswana 2017:11. There are also unlimited resources of salt and soda ash mined on a limited scale. The main challenge for the economy in view of the natural resources is the availability of markets.

The country has a several- party democracy custom with general elections held every five years. The ruling Botswana Democratic Party (BDP) has been in control since 1966. During the October 23, 2019 the 11th general elections were held and His Excellency the President Dr. Mokgweetsi Masisi won the elections and assumed the position of the president of Botswana. Furthermore, Setswana is the national language and English is the official language used in

government business affairs. Christianity is the leading religion and the country is a member of international organisations (Government of Botswana 2017:11).

Figure 1.1: Location of Botswana

Source: Department of Surveys and Mapping

2.3 Scope of the Botswana Public Service

The Botswana public sector covers the local authorities, parastatals and the public service. The public service is made up of all ministries and independent departments in central government. It is divided into three sub-sectors which include the following:

a) **Public Service sub-sector:** it covers all ministries and independent departments. Department of Public Service Management (DPSM) is entrusted with the responsibility The Directorate of Public Service

Management (DPSM) has the statutory responsibility for controlling the public service by the use of the Public Service Act.

b) **Local Authorities:** includes councils and land boards and they are controlled by the ministry of Local Government and Rural Development.

c) The Parastatal sub-sector: includes government agencies or quasi – governmental organisations established through the acts of parliament. Their main responsibility is to provide goods and services which central government is unable to provide. The government holds equal share in most parastatals in Botswana and the boards are responsible for managing them.

This study covered the following public service sub-sectors: Ministry of Youth, Sports and Culture Development (Botswana National Archives and Records Services), Ministry of Investment Trade and Industry, Ministry of Transport and Communications (e-government office), department of Information Technology, Ministry of Employment, Labour and Skills Development, Ministry of Finance and Economic Development Planning and the Ministry of Land Management, Water and Sanitation Services.

2.4 The Botswana Government Organisation

This section discusses the structure of the Botswana Public Service. The constitution of Botswana is made up of three arms which are the legislature, judiciary and executive. The constitution also includes a Bill Rights which guarantees certain fundamental rights and freedom. It gives all persons equal protection of the law. The three arms of government are explained below:

2.3.1 The Legislature

The National Assembly responsibility is to develop and implement laws of peace, order and good governance of Botswana. There are 61 elected

members of the National Assembly of which 57 are directly elected from their constituencies and four (4) of which are specially elected.

2.3.2 Judiciary

The Judiciary is an independent arm of government whose main function is to interpret the law and resolve disputes. It ensures that other arms of government act according to the constitution through a review process of their decisions. There is the court of appeal regarded as the highest and final court in the country. The High court is the second largest of record and has unlimited authority for all criminal and civil cases in Botswana.

2.3.3 The Executive

The executive is controlled by the President who chairs over cabinet. The vice president is selected by the president after approval and endorsement by members of the parliament. The ministers for all the ministries are nominated by the president within the National Assembly to become heads of ministries. The permanent secretary to the president is the head of the civil service while the administrative heads of ministries are permanent secretaries.

Chart 1.1: The Botswana Government Organisational Chart

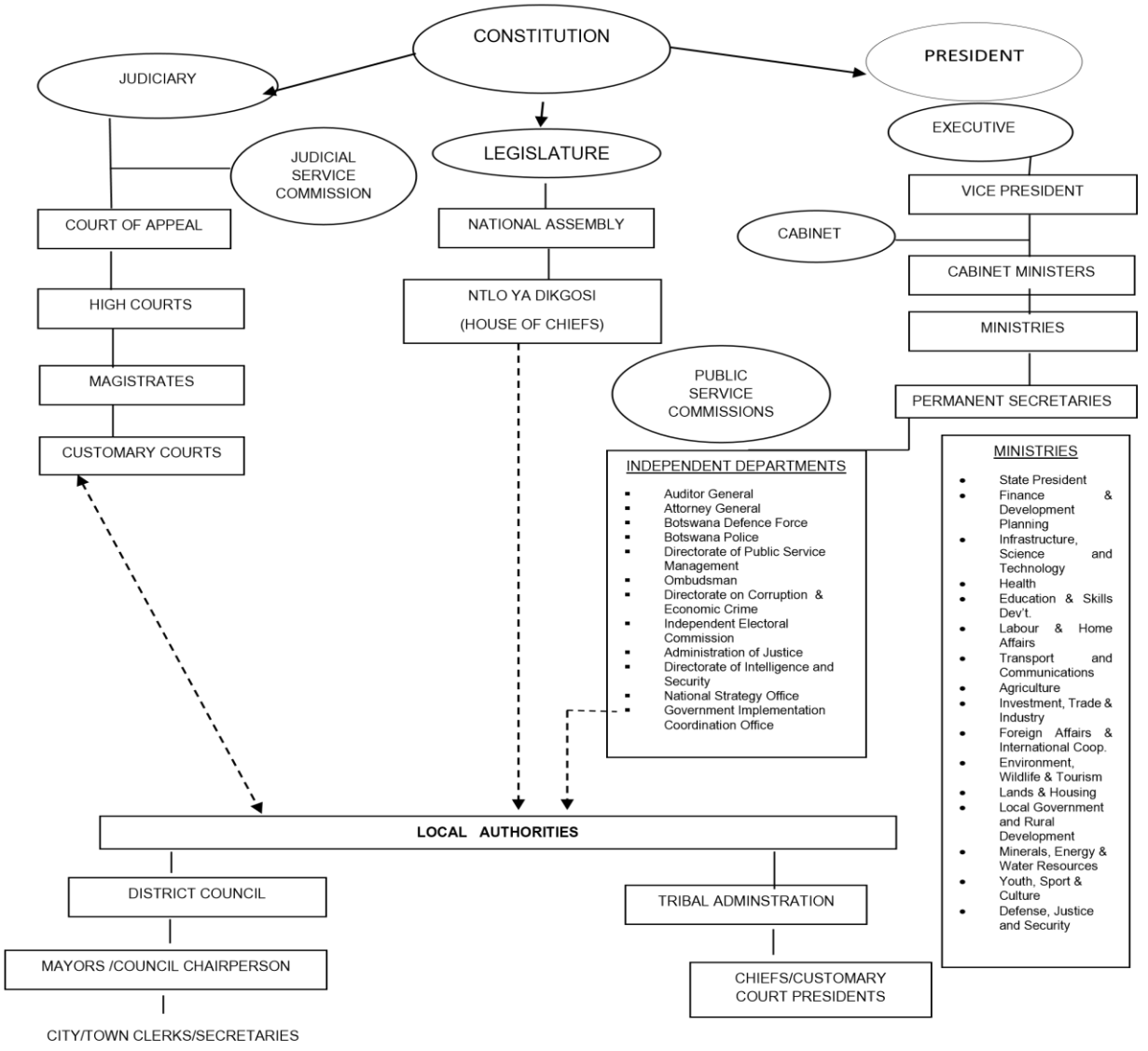


Figure 2.1: Botswana Organisational Chart

Source: Directorate of Public Service Management & Ministry of Finance and Economic Development.

The responsibility of the Department of Public Service Management is to develop strategies and practices to facilitate effective employment, employee competencies with employment relationships. A Public Service Commission is a department of DPSM whose responsibility is to attend to appeals in relation to dismissal and surcharges of government officers.

2.4 The Nexus of E-government and Digital Preservation

This section discusses the nexus of e-government and digital preservation. The use of ICTs is an integral part of the 4th industrial revolution. An era marked significantly by a fusion of technologies. E-government is recognized across the world as one of the efforts of improving the quality of life by ensuring that governments provide good and services and improve the quality of life in an extremely convenient and efficient way Throughout the entire world e-government has been widely been recognised not only by researchers but also joined international organisations. E-government signifies the introduction of a great movement of technological innovations as well as government re-invention or re-organisation. The World Bank DGRA (2020:6) states that most governments embarked on their digital change journey to improve administrative and operational efficiency by introducing the 'e-government' model which mainly focused on putting e-services online through the usage of ICT. Digital government initiatives are also about re-engineering and digitizing the office processes and workflow to reduce the red-tapes or delay in the delivery of services. Initially the first phases of e-government were based on existing business processes, so the digital government's main aim is to change the public administration processes so that they are improved and provided digitally hence improving service delivery.

The digital government change brings the need for amendments of legal, institutional, technological and cultural changes (World Bank DGRA Team 2020:14). It is very necessary for government to make necessary reforms to accommodate access to the digital world although it needs a high level political commitment. The United Nation (2020:10) survey global ranking indicated that there are countries which are at the fore front as compared to others in e-government development and these countries are: Denmark, Republic of Korea, Estonia, Finland, Australia, Sweden, United Kingdom of

Great Britain, Northern Ireland, United Kingdom, New Zealand, United States of America (here-in after referred to at the United States), Netherland, Singapore, Iceland, Norway and Japan. Leading countries in this area have established national "basic data registers" that enable government organizations to use and share standardized data for greater effectiveness (World Bank DGRA Team 2020:20). The United Nations (2020:44-45) states that from 2018 to 2020 in Africa there is a notable progress which shows that the region is undergoing digital change. In Africa, the four countries which are leading in e-government development as per their ranking of e-government with values above the global average of 0.60 and these are Mauritius, South Africa, Tunisia and Seychelles. In addition, most countries are still part of the middle EGDI group and these are: Namibia, Cape Verde, Egypt, Gabon, Botswana, Kenya, Algeria and Zimbabwe (United Nation 2020:44-45).

According to Bwalya (2018:105) there is still lack of sustainability in the implementation of e-government as many countries in Africa are still facing challenges in the adoption of digital technologies. Katuu (2012); Luyombya (2011); Mampe and Kalusopa (2013) are of the view that the aftermath of e-government initiatives and increasing digitisation of government business operations. As a result public sector authorities have come to rely upon a growing array of communication technologies to create, exchange, and store information from traditional paper-based filing systems, to structured databases, 'unstructured' content management systems, social media platforms, web technologies, and mobile platforms. Since many countries globally have come up with initiatives of digitisation programs of converting from the manual paper based to an analogue, it is worth noting that technology used is not for management of digital records (Katuu 2012). Luyombya (2011) carried out a study in Uganda on the management of digital records.

The study indicated that digital records were handled at individual ministry level with unregulated metadata to describe their content, structure and context, leading to challenges in strategically planning for digital records management. The need to preserve digital information for the public service delivery has been widely noted by various authors. In Botswana the e-government vision is to become the integrated government, by providing collective access to services in a convenient, efficient, transparent and reliable way (Government of Botswana 2015). During the year 2009, his Excellency the President, in the State of the nation address stated that 'In order to efficiently and effectively deliver public services to the people, government has embarked upon the automation and integration of processes through the e-government programme (Government of Botswana, 2012). The government of Botswana invested a lot of money since the inception of e-government project. There are several strategies that have been developed as the core building blocks of e-government but did not take into consideration the issues of digital preservation and digital continuity of information for posterity. The 2020 State of the Nation Address indicates that the country has adopted the 'Smart Botswana Strategy' currently at implementation stage. The strategy aims at promoting digitization as a way to transform and diversify the economy of the country (Government of Botswana, 2020:29). In addition, major initiatives have been introduced aimed at improving the delivery of quality services through digitization in different sectors.

The progress of e-government and digital preservation in Botswana is confronted with existing and new challenges and these have been pointed out by research. These new developments brought by the use of ICT's have affected the management of digital records in the entire Botswana public sector. The Botswana public service was faced with several challenges regarding service delivery which led to e-government programmes being

undertaken inadequately. Despite the efforts made in the drive of e-government and digital preservation this has, however, become a significant problem faced by Botswana Public Service. Little is known about how the Botswana public service is dealing with the difficulty of ensuring that digital records continue to be available for the current and future generations. The studies carried out on e-records in Botswana did not develop a framework which could be used by the Public Service to assess their readiness towards digital preservation transformation. This study designed a strategic framework for digital preservation capability maturity readiness in the context of e-government for Botswana public service. This framework will be used as an assessment tool by the public service that will ensure that digital information is managed in such a way that it will be easy to recover, open, work with understand and trust. Furthermore the framework will enable the public service to put in place, manage the processes and technologies required to keep the digital information complete, useable and available so that it is used continuously.

2.5 Summary

This chapter provided the historical and geographical location of Botswana, the organisational structure of the Botswana Public Service. It also demonstrated the evolution of e-government from the global perspective making reference to recent studies which indicate that Africa is still lagging behind in terms of the adoption of digital technologies. In the rankings provided by the United Nations Survey of 2020 Botswana was amongst the middle e-government development index which is an encouraging trend for the digitization of the country. Notwithstanding the efforts made by the Botswana public service the long term access to digital records is questionable and this uncertainty is a major impediment that remains a challenge. The next chapter discusses the literature review and theoretical framework of the study.

CHAPTER 3

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

3.1 Introduction

This section provides a discussion of the literature review and theoretical framework that guided the study. The chapter presents literature on digital preservation policies, strategies and security.

3.2 Characteristics of a Literature Review

According to Knopf (2006) and Cronin (2011) the reason of writing literature review is to:

- Spot each work with regards to its commitment to understanding the research issue being contemplated.
- Describe the relationship of each work to the others viable.
- Identify new approaches to translate prior research.
- Find out the gaps that exist in literature.
- Identify and resolve conflicts apparently contradicting previous studies.
- Identify areas of prior learning to avoid duplication of effort.
- Point the way in fulfilling a need for additional research.
- Find out as whether your own research fit well within the context of existing literature.

Arlene (2014) indicates that a literature reviews books, insightful articles, and some other sources applicable to a specific issue, area of research, or hypothesis and thusly gives a portrayal, outline and basic assessment of these works corresponding to the examination issue being researched. Literature review is intended to give an outline of sources investigated while exploring a specific subject and provide insights into how ones research fits inside a bigger field of study. A literature review may consist of a synopsis of key sources yet in the social sciences a literature has a hierarchical example and

combines summary and synthesis frequently within explicit conceptual categories (Cronin 2011).

To accomplish the aim and objectives of the study, this literature review discusses various topics identified with the research as follows:

- Digital Preservation infrastructure status in different countries;
- Digital Preservation Policy, strategies, collaboration and technical expertise;
- Digital Preservation Systems and Digital Preservation repository;
- The trustworthiness of digital records in terms of accuracy, authenticity, reliability, security and access.

3.3 The Digital Preservation Infrastructure Status in Different Countries

In recent years, throughout the world governments worldwide are faced with the challenges of changing, reinventing, implementing new government systems, and delivering cost effective services through information communication technologies (Georgescu and Georgescu 2008:242). The need to satisfy these needs has brought changes on a number of aspects in government management resulting in e-government. Today most government services are available on digital platforms such as internet, specifically web-based applications, and e-mail.

The development of information technology led to the creation of digital records. NASCIO (2007) purports that the challenge of digital preservation is due to the fact that the technology being used becomes obsolete, old digital records becomes inaccessible unless sustainable measures and approaches to enable accessibility are implemented. Moreover, related are the challenges to the authenticity and integrity of digital records exhibiting that a digital archive is the first or official report. The International Council on Archives (2016:16) states that the digital records are stored away on variety of medias such as

CDs. External hard drives, floppy disks and others. Garrett and Waters (1996) note that for digital preservation to occur it needs the organizational effort and related factors.

According to the National Science Foundation and the Library of Congress (2003:7) the development of infrastructure for digital archiving is strongly driven by the need to support multiple communities. However, it is vital to note that each community has its own requirements that will influence the content, organization, design, and services of digital archives.

To develop a permanent infrastructure that will preserve digital records there is need to recognize ideas, systems, and inventions that can fulfill normal necessities for storage capacity and access (National Science Foundation and the Library of Congress 2003:8). The identification and transfer of digital records from public institutions into archival repositories has not occurred in a systematic manner due to the fact that the national archival system has attempted to viably manage those records and encourage long preservation. However, these records are not overseen by their organisations because of absence of framework, skills to forever safeguard and make them available in future (Ngoepe & Keakopa, 2011).

Ngoepe and Van der Walt (2009:10-11) express that nations like Canada have an advanced preservation infrastructure for the capacity of digital records. Furthermore, the preservation of documented archival heritage is the duty of the Library and Archives Canada (LAC) which was set up in May 2004 because of a consolidation between the National Archives and the National Library (LAC 2004). The LAC's digital preservation is committed to long term preservation design agreeing using the OAIS (Open Archival Information System) standard.

In Australia, the National Archives has a digital preservation facilities which has a secure and stable environment that houses processing networks, a digital

archive and a separate laboratory for staff (Ngoepe & Van Der Walt 2009) The National Archives of Australia (2008) stipulates that at the time they selected the hardware and systems for their digital preservation prototype, the NA avoided relying on any single vendor or technology thus enhancing its ability to deal with hardware obsolescence. In the event of an operational flaw in any one operating system or vendor, an alternative is available, therefore, the risk of losing data is low.

South Africa National Archives developed guidelines for the administration of electronic records. However, absence of infrastructure consequently remains a principal challenge making it difficult for the organisations to realise the policy (Ngoepe and Van Der Walt 2009). The National Archives and regular reports in South Africa reflect that the country does not have a capacity component for electronic records set up. In addition, since there was no system for protection of electronic records in South Africa, essentially all organization divisions have not yet moved or transferred digital records to the National Archives and Records Services and prefer to keep them in their own custody. In any case, they may go up against troubles of finding and recuperating a record after a particular time period Ngoepe and Van Der Walt (2009). It was likewise perceived that various organization divisions pulverize material when it is not actually the case as the organisations may need the records in future.

3.4 Regulatory Framework of Managing Records and Digital Preservation

There are several regulatory frameworks that are used in Botswana for management of records. Simon and Mosweu (2019:71) points out that records and archives legislation is a fundamental component of the wider legislative base of an accountable and effective government. Ngoepe and Keakopa (2011) express that Botswana's archival legislation has been found to be feeble when it comes to providing guidance to advance records and archives

management. The regulatory framework that are used for management of records in Botswana are as follows: BNARS Act of 2007, National Information and Communications Technology Policy (Maitlamo Policy) 2006, Electronic Evidence Act of 2014, Public Service Act 2008, Copyright and Neighboring Rights Act of 2000, Evidence in Civil Proceedings of 1977, Electronic Communications and Transactions Act 2014, National Security Act 2005, Public Audit Act, Public Finance Management Act, National ICT Policy and e-Government Strategy. The NARS Act gives the director of BNARS certain powers and privileges in relation to the preservation of the national documentary heritage in Botswana. The NARS Act of 2007 does not state on how digital records should be managed from creation until they are disposed. This is why Botswana Public Service faces challenges in terms of management and preservation of digital records as the act does not provide guidance relating to management from creation until they are disposed.

Marutha (2016:28) further observes that in most African countries, the extent of records and archival law covered the fundamental model of paper based records filing just as the document obligations which ended up being a test to numerous authentic organisations with regards to overseeing digital records. Kalusopa, Bayane and Mosweu (2017:9) express that there is a need to change the NARS Act of 2007 to incorporate the management of digital records in the country.

3.4.1 Digital Preservation Policy

The preservation of digital records and future retrieval is impacted by legitimate prerequisites. In lower asset nations, where records of executive programs are frequently inadequately resourced, it is regularly the situation that the structures expected to help digital records management have not yet been developed (International Council on Archives 2016). A documented policy is an indication that the organization takes the duty to preserve digital material.

An arrangement frames the mainstay of a program for advanced preservation and therefore provides common guidance for the entire association, and as such it stays on a sensibly significant level. Moreover, real strides now in executing and safeguarding programme have to be as per the policy to ensure their intelligence (Erpanet 2003). The main purpose of a digital preservation policy is to characterize why an association is doing advanced protection and how digital preservation enables the archive to accomplish its core destinations. The policy will also show how computerized conservation lines up with any parent association's more extensive vital objectives (The National Archives of United Kingdom 2011:7). There are key reasons as to why it is imperative for a methodology to be in place. A clear methodology provides guidance and approval of advance materials, it guarantees their authenticity, reliability and long term accessibility. Possibly an archive might be offered digital records from a wide scope of sources; nonetheless, the approach should distinguish its inclusion to promise that it revolves on digital records that are relevant to the acquisition and assortments strategy.

Furthermore, a characterized inclusion additionally permits a file to consider dismissing records that drop out of extension if their assortment and conservation of them is excessively troublesome or past their capacities for protection. Options may be to save only some of their characteristics or propose their store in another file (The National Archives of United Kingdom 2011:7). A digital preservation policy should ensure numerous advantages by every institutional level, for example, guaranteeing advanced materials accessible for current and future use, giving a thorough proclamation and arranging cognizant advanced safeguarding programs. Besides, the formulation of a policy allows deal with difficult subjects as the short-lasting life span and small capacities of digital materials. In addition, the obsolescence of the hardware and software for reading, access and the

structural and technical heterogeneity of the different types of digital materials (Beagrie 2003).

A preservation policy defines how to oversee digital records in an archive to avoid loss whatsoever. The new legislation for the creation, management and preservation of digital records has not yet stayed up with new technologies. Kalusopa and Zulu (2009) outlines a number of factors that result from a weak policy formulation on digitization in Botswana. These are frail legislative framework for digital preservation, absence of awareness about the potential of digital preservation by national heritage institutions and absence of common standards on digital heritage materials preservation in Botswana. In different nations some of the things not in place include the absence of laws and approaches, guidelines and capacity building for employees expected to guarantee that digital records remain available and dependable.

3.5 Digital Preservation Strategies in Maintaining Digital Records

Reséndiz (2016) observes that advanced preservation combines approaches, systems and activities to guarantee admittance to reformatted and brought into the world computerized content in spite of media disappointment and innovative transformation. The objective of digital preservation is the exact delivering of the confirmed content over time. Note (2018) is of the view that as an overall population, we are moving into a period where a lot of what we know today, a great deal of what is coded and created electronically, may be lost everlastingly without proactive safeguarding. Holdsworth (2007) advices that to ensure that digital data remains accessible and re-usable over time, there is need for the execution of proactive, versatile and supportable preservation strategies. Different strategies have been set up by different organisations throughout the world to ensure that the preservation process is successfully implemented.

Vermaaten, Lavoie and Caplan (2012) suggested that building an effective digital preservation strategy adds up to representing and alleviating different dangers to the accessibility and useability of digital records over time. The systems for digital records preservation should be lined up with the association's general way to deal with its data resources and above all with its way to deal with the organisations business. The advanced records preservation plan should be incorporated into or connected with the more extensive key headings and needs of the association (ICA/IRMT 2016: 24). A scope of devices exists today to help the assortment of safeguarding systems, for example, movement or imitating yet extraordinary conservation prerequisites across establishments and settings settle on the choice on which answer for carry out extremely troublesome. Strodl et al., (2007) set that each situation has its own requirement and issues, calling for various system to determine the current issue.

3.5.1 Emulation Preservation Strategy

Granger (2000) places that the fundamental thought behind emulation is to be capable to access or run unique information or programming on a current stage that imitates the first stage. This is similar to the migration as it is able to provide an important service utilising emulators. A more exact propagation of current computerised objects and their preparing climate can be checked and somewhat long term access is ensured. This technique requires the creation of emulators, programs that interpret code and directions between structures. Under copying, more established information will run on contemporary personal computers (Note 2018).

Research has proven that emulation does not expect changes to the item or its design. However, it moves the basic equipment, the first condition of the computerised article and its validness is protected. In 2004, the Netherlands library known as Koninklijke Biblotheek recognised the requirement for

imitating, particularly for delivering complex and advanced items without influencing their realness and respectability (Hoeven et.al 2007:123).

3.5.2 Migration Preservation Strategy

The aim of migration is to modify the object in such a way that changes in the hardware and software do not impact its accessibility. This includes content migration, which converts data from one format to another, as well as media migration, which transfers data from one medium to another whether digital or non-digital (Gbaje 2011).

The ISO 13008:2012 alludes to this process as a change and gives direction for both conversion and migration strategies.

As stipulated by the National Archives of UK (2017) moving digital records from one format to the other raises the risks of loss of content or context, or the ability to access it, so that :

- information needed may be found
- information needed may not be opened
- one may not work with information in the way needed
- may not understand what the information is, or what it is about
- information needed may be found
- information needed may not be opened
- one may not work with information in the way needed
- may not understand what the information is, or what it is about

During migration there is data loss which upsets significant business data regarding the unwavering quality, access, retrievability and authenticity. This is an agonizing process which continuously brings files into a smaller

assortment of standard record formats. However, this requires cautious arranging and the management to guarantee that certain factors in place. These include comprehension on how the data should be utilized, keeping up the fulfillment, accessibility, consequently convenience of the data throughout the relocation interaction and dealing with the dangers engaged with moving the data on the systems used for migration.

3.5.3 Encapsulation Preservation Strategy

Encapsulation preservation strategy is a supplement of the migration strategy which depends on the guidelines to maintain readability. As indicated by Boudrez, Dekeyser, & Dumortier (2005) encapsulation is a capacity method where metadata is added to a computerized object or a few records are gathered in one advanced article. Ferreira, Baptista, and Ramalho (2006) argue that encapsulation strategy is generally oriented at collection of objects that are expected to remain unexploited for long periods of time. This strategy plans to counter old record designs by gathering subtleties of how to decipher the computerized bits in the articles using physical or consistent constructions called holders to give connection between all information components, for example, the advanced item and other supporting data (National Library of Australia 2001).

3.5.4 Refreshing Preservation Strategy

Refreshing is the way toward replicating records and other information starting with one stockpiling medium then onto the next of a similar kind with no change streams. For example, refreshment may copy digital records from a CDROM disk to another so that records can be accessed using the same information system (Government Records Service 2008:6). This is similar to media migration which involves the process of moving data form one storage medium to another (Reis and Lindley, 2007). Gbaje (2011) points out that physical storage devices degrade over time and technological advances make

older storage devices unavailable to new computers, constant refreshing will likely be necessary for long time.

3.6 Cloud Computing Preservation Strategy

Cloud Computing is one of the models for digital preservation strategy considered as a solution to digital records preservation. Digital Preservation Coalition (2019) states that several archives have been able to address the most widely held concerns over cloud services and have found ways to successfully integrate cloud storage into their digital preservation activities. In addition, some of the archives make use of cloud based services for all or part of their other computerized preservation functions such as preservation arranging. Indeed, securing cloud administrations is like getting any electronic framework; everything necessary is to oversee and address chances much the same as other piece of an electronic infrastructure. Kalusopa (2018:56) confirms that cloud computing strategy has been used in the libraries and archival communities as some of the services have been migrated without any challenges encountered.

The long-term preservation of digital objects is a challenge facing organisations. This study develops a strategic framework for digital preservation capability maturity readiness in the context of e-government in Botswana public service. This will assist the entire public service to preserve their digital heritage for enduring value and posterity as it has the capacity for users to recover, show, and use them notwithstanding constantly changing technology. Furthermore, the framework will provide authentic, accurate, identifiable and verifiable digital records for decision making.

3.7 Technical Expertise in Managing and Preserving Digital Records

Note (2018) states that the archival field globally lacks people with the expertise needed to extend the digital preservation agenda. Records experts have not yet been presented to the abilities expected to oversee digital records

in Africa yet at a similar time, digital records are being produced at an intensified rate (ICA/IRMT, 2016:6). Formal training opportunities for digital preservation are still rare, so much is learned on the job (Note 2018). There are global training prospects for specific research projects dedicated to management of digital records as follows:

- The InterPARES 3 developed teaching modules such as training programs, continuing education workshops, and curricula. The aim of training is to provide professionals with the competency to preserve digital heritage and protect its accuracy and authenticity. In Africa these InterPARES research are ongoing on management of digital records holistically.

- The PERICLES project (Promoting and Enhancing Reuse of Information throughout the Content Lifecycle taking account of Evolving Semantics), is funded by the European Union, and has produced a series of online, self-instructive, stand-alone modules.

3.8 Digital preservation systems in managing authentic digital records in terms of reliability, accuracy and integrity

Laura (no date:127) accentuates that the essential elements of digital information systems of personal computers are to make, oversee, control and distribute information. Authentic archival repositories are answerable for the management of legible, understandable, recorded information. Archival repositories, traditionally responsible for the management of readable, visible, recorded information, are now faced with having to identify and preserve information that is not readable with the naked eye. They have also been recorded using non-traditional methods, and are highly technology dependent.

As specified by the ISO/TR 15801:2009 (E) a trustworthy information management system is one that guarantees that all digital stored data can be viewed as a useable and exact duplicate of the original information, irrespective of the original format. A trustworthy information management system has to incorporate the following:

- The making of in any event one duplicate of the kept data on to media that safeguards the kept information from alteration, improper annotations or erasure all through its affirmed lifecycle; this duplicate should be put away and kept up in safe area that is isolated from the other duplicate of the kept data.
- The use of the hardware equipments and storage media that safeguard the stored information from alteration, improper annotations or removal all through its endorsed lifecycle;
- The ability to check through independent review cycles of the product equipment as well as capacity media ideas that the first kept away data can be delivered precisely all through its affirmed life cycle.

A trusted document management system utilizes a combination of organizational policies, operational procedures and appropriately installed and managed technologies as described in this Technical Report that will enable an organization to demonstrate trustworthiness and reliability.

Holdsworth (2007) states that the principal reason for protecting digital records is to empower admittance to them at some undefined date later on, most likely for purposes not expected by the makers. Records experts need to comprehend what is engaged with safeguarding records over long periods to in order to secure the records' legitimacy and respectability (ICA 2016:14). As demonstrated by International Council on Archives (2016:5) making and ensuring computerized records and saving their honesty is a challenge for all

associations and all nations around the world. This is due to the brittleness of electronic media, the shortfall of the exact, comprehensive metadata with the quick outdated nature of programming, the rapid obsolescence of which place digital records at absurd danger in an event that they remain not overseen expertly.

MacKenzie (2000) opines that reliability is linked to the creation of records rather than their management, and is contingent upon providing contextual information. In the case of electronic records, this means persistently linking contextual metadata such as date of creation, organisation, and functional classification to the record. Such metadata is required additionally to keep up and demonstrate the personality of the records, so it is a requirement for authenticity as well.

As per the InterPARES Authenticity Task Force, the trustworthiness of a record alludes to its completeness and sufficiency and consequently records kept up in electronic systems, the assumption of reliability should be maintained by proof that a record is the thing that it implies to be and has not been changed or debased in fundamental regards. Safeguarding the character and respectability of a record in the advanced world is convoluted by the way that, in a particularly world, there are no steady and suffering actual items. This point is additionally made by Thibodeau who saw that, it is beyond the realm of imagination to expect to protect an electronic record.

As specified by PREMIS Editorial Committee (2012) metadata norms, for example, PREMIS, MODS and METS can help guarantee consistency and nature of metadata. However certain requirements need to be in place. For instance; the presence of functional framework with sufficient mechanical arrangements, a complete structure of approaches, methodology and techniques applied from the hour of creation and catch through the drawn out protection of advanced records. Fixity can be tried against put away message

digest data and the actual testing recorded as an occasion (PREMIS Editorial Committee 2008:200). A digital signature is a basic innovation that should be operational in an advanced safeguarding store to ensure the integrity of the digital records. A digital signature gives credibility to a substance that will be protected (Jantz and Giarlo 2005).

Lowry and Wamukoya (2014:200) state that in East Africa as of now, the absence of definitive digital records that can give the proof of the decisions, activities and exchanges presents significant issues. It influences resident's capacity to ensure their privileges and qualifications on the off chance that they are depending on digital records yield by government data correspondence innovation frameworks. Likewise poor record keeping endangers the trustworthiness of advanced records as proof yet they obstruct computerized records preservation. In Sub-Saharan Africa, government offices use paper based systems although efforts are made to migrate to a strategy that will introduce a digital environment in their daily business transactions (Kanyengo 2009). Despite the fact that interoperability between active e-government systems has been a significant area of work during the last decade, the fact that much of this information needs to be preserved for the long-term after the initial creation has been ignored, and the re-use of data has been of secondary concern. Preserving digital records integrity and accessibility must be considered in relation to the organisation’s broader information management frameworks.

3.9 Trusted digital preservation repository

Lemieux (2016) states that guaranteeing reliability of a record is an important prerequisite. There is need for an explained scope of various settings wherever a system is created. These should provide a record of basic fundamentals important to accomplish improvement targets. At Georgetown University Library use Academic Preservation Trust (AP Trust) has a dark, distributed digital preservation repository responsible for keeping digital materials in a

cloud storage called Amazon web services. They are in Virginia and Oregon. Digital records are ingested and are made six copies of each per zone. However, the base 10TB of storage per affiliated member amounts to 60 TB. Along with the other preservation actions performed by APTrust, this distribution should help ensure long-term preservation of Georgetown's digital materials. Certification is a means to other ends, useful where required or valuable for outreach and trust. The trustworthy digital repositories can "provide reliable, long-term access of managed digital resources to its designated community, now and into the future" (Beagrie et al., 2002). In such manner there was an exploration study directed which investigated the administration of advanced records in Botswana (Kalusopa et al., 2017).

Libraries Group (2002) shows that trust is focal in this interaction, and requires a methodical, discernible, and responsible way to deal with overseeing advanced objects. The Research Libraries Group (2001:5) describes an automated vault as an affiliation that has obligation with respect to the long stretch support of computerized records, similarly concerning making them available to networks agreed on by the contributor and the file. Computerised vaults are expected to capacity of advanced data and they look like libraries with the exception that they store advanced information rather than printed variant materials. A trusted digital archive repository is one whose mission is to give solid, long haul admittance to oversee computerized assets to its assigned local area, presently and later on in the future (The Research Library Group 2001).

Dobratz and Schoger (2007) are of the view that a long term digital repository is a puzzling and interrelated framework wherein the advanced information is administered, including the association running the vault, its organization, structure, staffing, arrangements, licenses and liabilities under which it should work. A trusted digital repository should start with 'a mission should begin with 'a mission to give solid, long term access to manage digital resources to

its designated community, now and into the future. Pastry specialist et al., (2006) shows that an accepted progressed chronicle should get risks and perils inside its frameworks. For instance, media disappointment, programming out of date quality, equipment disappointment, administrator blunder, interior and outer assault, monetary disappointment, cataclysmic event and authoritative disappointment. The Research Library Group (2001) posits that a trusted digital repository cannot just say what it will do rather it must indicates that an organisation which chooses to turn into a trusted digital repository will set up itself in manners that show its feasibility and trustworthiness. Its mission statement will reflect commitment to the drawn out maintenance and the board of and induction to cutting edge social assets for depositors and users.

3.10 Trustworthiness of digital records

Digital trust of documents has become an increasingly important research area (Ma, Abie, Skramstad and Nygard 2011:3). Duranti and Rogers (2012) are of the view that the trustworthiness of records depends on four factors; knowledge about the creator or custodian of the records thus reputation, past performance, competence and assurance of confidence in future performance. Ma, Abie, Skramstad and Nygard (2011) states that digital records are replacing paper records to an ever increasing degree due to their nature of being easily modified and transferred. Although, it is easy to assert the trustworthiness of digital records but at the same time difficult to present an objective basis for the assertion. Nowadays there are frameworks that have been developed for establishing trust as technology has advanced. The trustworthiness of a digital record is based on its accuracy, authenticity and reliability as explained in the next sub sections.

3.10.1 Accuracy, authenticity and reliability of digital records

Duranti (2014:14) expresses that the accuracy or exactness of a record is the rightness thereof and the credibility of its content depends on the capability of its creator and the controls of its creation. The importance of the idea of

unwavering quality and credibility result from diplomatics (Rogers 2015). The dependability of a record, that is, the thing that implies to be, untampered with uncorrupted dependent on personality, trustworthiness, and reliability of the system. Reliability of a record means an assertion of certainty dependent on the capability of its creator and the controls of its creation (Duranti 2010:14). Reliability is the sole obligation of the creator of the record, through the record structure and methodology of creation and reliability of the individual associated with its creation (Rogers 2016:11). Research conducted in the preservation of authenticity in the context of digital preservation does not give quantifiable control and models that can reduce the problem to concrete, atomistic elements are elusive. Rogers (2016) specifies that reliability is represented and assured by the creator. This ranges from all the aspects involved such as procedures followed, methodology, technological controls of the individual, process of creation as well as definition of record forms.

(Duranti and MacNeil 1997). Add that authenticity is guaranteed by the adoption of procedures and technological methods aimed at ensuring their proper identification in the context of their administration and documentary, secure transmission and implementing intellectual control through archival description. Mosweu (2019:56) further demonstrates that authenticity is secured by establishing strategies that guarantee that a record is not controlled, altered or misrepresented after creation and that it remains reliable as it was initially created. As for Rogers (2016:56) authenticity is decided based on proof given by provenance information. Consultative Committee for Space Data System (2012:1.9 -1.14) shows that authenticity is an objective of long term preservation and it is the obligation of the repository as well to protect the authenticity of a record. Mosweu (2019:57) noticed that the strategies or group of rules identifying with the records creation decides its reliability. Such body of rules administers the making, receiving and alludes to building up who is skillful to create, adjust, annotate records and how records ought to be

routed and documented. The findings of a study by Bhebhe (2015:107) show that the national digital heritage of Zimbabwe was being lost because of the archival legislation that was silent on digital records. The administration and preservation of records in a digital environment are problematic because of absence of storage and preservation measures in many countries (Mosweu 2013:5-7) and Marutha and Ngulube (2012:47-52).

3.10.2 Security and access of digital records

Laudon (2005) implies the policies, procedures and specific measures used to forestall unapproved access, modification, theft and actual harm. The security of such records is fundamental to ensuring their reliability, integrity and evidential value. The security of electronic government is a core concern to citizens, government and enterprises. For this reason the need to improve security, privacy and trust in order to build confidence in e-government services is globally recognised (European Technology Assessment Group 2011). Security aspect in information systems have as of not long ago been more concerned with harm towards the information related to confidentiality, integrity or accessibility. This must be balanced with the requirement for official records to be readily accessible to authorised persons (Rajasekar, Moore, Berman and Schottlaender 2005). With e-government the requirement for security in communication networks is increasing and flexibility against network attacks (access, alteration, denial of service) is of crucial significance.

Preservation and access are cut out of the same cloth subsequently they are reliant to the point that entrance can be viewed as a vital piece of safeguarding. Although preservation is a continuous process, it is important to ensure permanent accessibility. Deprived of the goal of the right to use, it has no point. It is worth noting that saving digital records is significantly more difficult than saving records on paper format, film, and sound video data. Given the today's transformation in information technology, digital records created today might not be accessible to interpret from now and in future.

Grawrock (2006) states that dangers to organise security for instance; digital illegal intimidation, digital reconnaissance, and advanced persistent threats, mixed dangers are consistently changing as weaknesses in both set up and recently presented systems are found and answers for counter those dangers are required. Measures to guarantee network security involve firewall and intermediary to keep undesirable individuals out, antivirus programming, and internet security software suites against malware, encryption, and security fencing just as improved computer models. The security of records is crucial to guaranteeing their unwavering quality, honesty and evidential value. Nonetheless, organisations should comprehend the affectability of records to hold, so the security characterisation and measures ought to be applied in systems (Government of South Australia, 2018). Several repositories or vaults save data under access constraints on account of licensed technological rights, insurance and confidentiality or public security classification. Controlled access to storages ought to administer restrictions that outperform the lifetime of individuals or even of organisations over a period of time (National Science Foundation and the Library of Congress, 2003).

3.11 Theoretical Framework and its Importance in Research

This section provides the theoretical frameworks that guided the study as well as positives and negatives of the framework in managing the information. Grand and Osanloo (2014) state that a theoretical framework is a diagram or guide for a research. This is the researcher's focal point with which they use to see the world as it provides the basis upon which a research is built. Ngulube (2020) adds that theoretical framework is the foundation of research and the logical knowing relies upon a rich hypothesis. Also it is very important for researchers to create a hypothesis that is relevant to their investigations and avoid acquired speculations.

In a postgraduate theory or dissertation research, all sections of the research are required to interface with the theoretical framework (Grant and Osanloo 2014). The student must select a relevant theory that supports the research topic being examined. However, the research conducted is relied upon to make a remarkable use of the chosen theory to apply the theoretical constructs to their study.

Grant and Osanloo (2014) present the following checklist against which one can establish a reasonable theoretical framework for their research inquiry:

- Does the theory concur with the methodology for the study?
- Is the theory chosen very much evolved with many theoretical constructs?
- Have specific ideas or hypothetical standards been chosen to meet the objectives of the research?
- Does the issue investigated, the reason, and the significance of the examination correlate with the theoretical framework?
- Can the theory be utilised inseparably with the research questions for the study?
- Does the theoretical framework advise the literature review?
- Does the data analysis concur with the chosen theory?
- Does the theoretical framework undergird the conclusions and recommendations based on the data analysis?

There are several benefits that come with the right choice of a theoretical framework in research. These includes the ability to clarify one's implicit construct in terms of reflecting how a researcher defines their study rationally, epistemologically, methodologically and scientifically (Grant & Osanloo

2014). It makes research findings more significant and besides generalisable (Akintoye 2015). The significance of hypothesis driven reasoning and acting is underlined corresponding to the choice of a topic or theme, the improvement of research questions, the conceptualization of the literature review, the research approach, and the analysis plan for the thesis study (Grant & Osanloo 2014). Simon (2011) asserts that hypothetical structures extend the embodiment of the research. There is no great or right theory for a thesis, however certain theories are well known.

To accomplish the goals of the examination the digital capability maturity model was received and used. This model was created by Ashley and Dollar (2013). Dollar, Ashley and Misic (2019) express that the Capacity Maturity Model was created in 1990 to empower associations to survey the development of their product advancement measures and distinguish key practices important to improve the ability of those cycles. It is a device that can be utilized to assess current preservation capabilities and to create a prioritised plan of activity. As determined by Dollar and Ashley (2014) the digital preservation capability maturity model was created to empower organisations to assess the advancement measures and see key practices basically to improve the constraint of those cycles. Ashley and Misic (2019) show that the need and commitment to preserve digital records should be motivated by the organisation's objective, vision and values.

The model organizes the digital preservation requirements of the ISO standards into fifteen components with metrics to assess maturity (See figure 3.1). This model was used in this study in terms of finding out preservation issues from the time digital records are created or captured, identifying gaps, finding the capability levels and preservation performance metrics, establishing priorities for achieving enhanced capabilities to preserving and ensuring access to long term digital records. An index score from United

States Archives was used as a benchmark and the status for each Ministry were as follows (See table 5.13). The Botswana Public Service assessment was at nominal level and the assessment tools that were used are shown in figure 5.10 and 5.11.

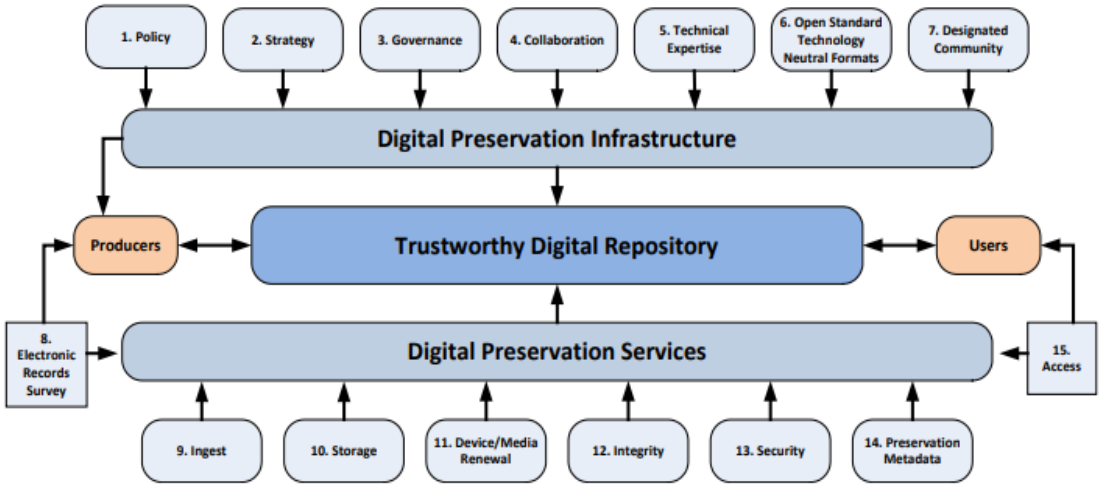


Figure 3. 1 Digital Preservation Capability Maturity Model – (Ashley and Misic 2019)

Maturity models are devices which organisations and industries can use to assess their preservation practices and progressions (Caralli, Knight, and Montgomery 2012). Ashley and Misic (2019) show that the DPCMM is a construction used for assessing an organization's capacity to save and offer access to electronic records. This is facilitated into three areas which are the digital preservation infrastructure, trustworthy digital repository and digital preservation services.

The digital maturity model can be presented in stages or levels which permit an organisations to evaluate its present authoritative state, decide its future or to be state and recognise how it should deal with arrive at that future "to be" state (Caralli, Knight & Montgomery 2012). The figure 3.2 model recognises 5 phases which are as per the following:

- The level 1 indicates that various digital records that validate long term preservation are at risk. An organisation should be more alert about its advanced assortment and it should come up with ways to deal and manages those risks. In this level preservation policy is still being developed and projects carried out at this level are at an input level.

- At level 2 some of the digital records that legitimate long preservation stay in danger. This would suggest that most of the digital records are dealt with and that lone piece of the in general advanced assortment is in danger. That is, the second and advanced safeguarding strategy has to be set up and generally scattered among the partners, who have to be convinced that the organisation understands what it is doing. The preservation strategy should to be itemized enough for staff to make methodology, related to the chosen collections preserved (Caralli, Knight & Montgomery 2012).

- Level 3 show that barely any digital records that legitimately deserve long term preservation are in danger. The current preservation policy is routinely evaluated and refreshed and will be point by point enough for staff to create methods for all assortments saved.

- Level 4 show that not many electronic records that legitimately deserve long protection are in danger. The preservation policy is consistently inspected and refreshed on a case by case basis considering upgrades.

- In level 5 there are no electronic records that legitimately deserve long preservation are in danger. This implies that all the necessary tools are set up.

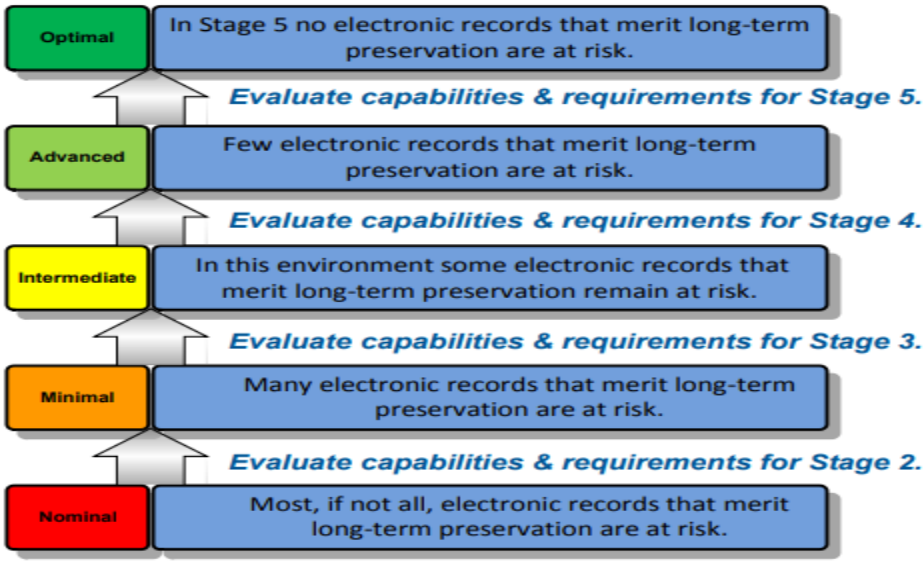


Figure 3. 2 Preservation Matrices (Caralli, Knight & Montgomery 2012)

3.11.1 The Preserve or Forget Reference Model

This is a model which is used for assessing the preservation metadata of multimedia content and it addresses issues related to the preservation of audio visual contents (Allasia, Bailer, Gordea & Chang 2014b). The plan of the model was motivated by the distinguishing proof in the five required qualities for such a reference model which are that it should be integrative, esteem focused, mind enlivened, neglectful and development mindful consequently to go with the new patterns (Allasia et al 2014). Mezaris, Niederée and Logie (2018) seen that oversaw preservation and failing to remember could be seen as a bunch of human superpowers accomplished using a long period of collected information, exceptionally compelling contextualisation, conglomeration, association, summarisation and remaking of key highlights of encounters however people are poor at protecting a lot of detail data. The figure 3.3 illustrates how understanding human psychological capacity can assist with moving more helpful in the digital storage systems that provides reliable and functional digital storage systems that offer dependable and

usable tools which can complement and maintain human memory rather than displacing it.

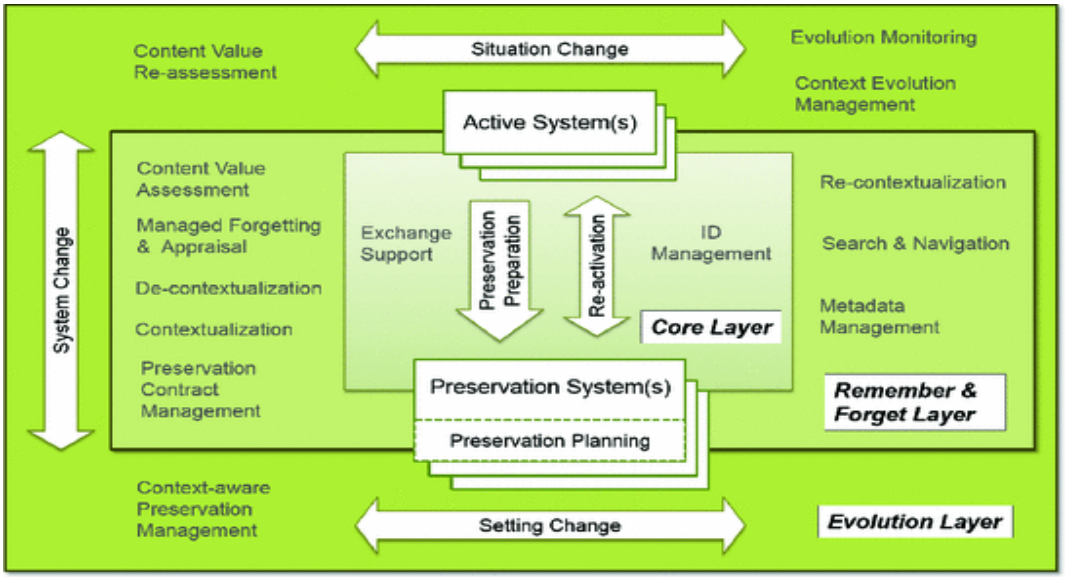


Figure 3. 3 Preserve Model - (Allasia, Gallo, Maus, Nilsson, Andersson & Niederee 2016)

The figure 3.3 reflects that the human inspired digital forgetting is the key for accomplishing a really synergetic connection among human and advanced memory. This model is helpful in digital storage systems that offer solid and useful tools to complement and support human memory. This model was not valuable for this study since it just shows that it works like a human memory which has inclination of failing to remember. The other shortfall of the model is that, there were no procedures inside the framework to assist advanced records being recovered in future.

3.11.2 Open Archival Information System Reference Model

The Open Archival Information System Reference model is the most regularly referred to standard in advanced protection created as applied structure for a documented framework committed to safeguarding and keeping up admittance to computerized data over the long haul". Michael (2016) states that the model

was created in an open discussion that gives a structure to the comprehension of chronicled ideas required for protecting electronic records and data over the long haul. As such, it is a determined structure for a chronicled system focused on preserving and keeping up permission for electronic information for a long period of time.

Open Archival Information System Reference Model addresses an administration structure for getting, overseeing and making accessible advanced resources (counting computerized records) that should be held as long as possible. It centres around three separate yet related parts which portray the outside climate inside which the OAIS works; the practical segments which satisfy the OAIS's protection obligations and the data objects overseen as well as scattered by the model.

Michael (2016) is of the view that computerized preservation certifies that electronic data requiring maintenance because of its worth or the need to remain agreeable to laws and guidelines is true, open and useable for quite a long time to come in spite of innovation changes. However, the OAIS model is a theoretical structure for digital documenting and doesn't need any specific platform or framework hence can be utilized to address the difficulties of preserving digital data. A few creators, for example, Egger (2006), Allinson (2006) and Beedham, et al (2005) censured the OAIS model taking note of that there are irregularities in the determinations as some are general while others are definite.

The Open Archival Information System Reference model blueprints the language and structure for depicting long haul protection frameworks and portrays the jobs and obligations of framework members, yet it doesn't give any measurements by which to assess safeguarding archives regarding dependability (Marks 2017:484). This examination centres around evaluating the uprightness, unwavering quality and validness of advanced archives, so

the model was not be embraced as it doesn't give veritable computerized safeguarding storehouses to advanced records with time as it can without much of a stretch be influenced by innovative changes. This shows that the Open Archival Information System Reference model can be influenced by quick outdated nature brought by the data advances and cannot protect computerized records for an extensive stretch of time.

3.11.3 InterPARES Preserve Electronic Records Model

The InterPARES Preserve Electronic Records model gives a conventional protection technique to preserving authentic electronic records. There are various stages that were created supplementing each other in this model. Dale and Gore (2010) specify that InterPARES stage 1 (1999-2001) incorporated the improvement of movement models for the determination and protection works, and made a system for prerequisites for surveying and keeping up legitimate electronic records. This model characterizes measures explicitly identified with protection and conveyance of bona fide electronic records and zeroed in on safeguarding related exercises that are fundamental.

Stage 2 of the InterPARES Preserve Electronic Records model focuses on digital records which are active and realistic. The principle objective is to develop understanding surrounding their methods of creating, maintaining and preserving accurate, authentic and reliable records in the arts, sciences and governments. The third stage, (2007-2012) centers around the development of hypothesis into training through constituent appropriation and instruction. Besides, the InterPARES 4 (2013-2018) also handles issues on the dependability of computerized records utilized on online conditions (Rodgers 2015). These InterPARES Preserve Electronic Records model is a reference model which did not receive much examination on the grounds that it is a conventional model in nature utilized for protecting true electronic records. Since they included explicit safeguarding choices, the consensus of the model

would be undermined. It will be hard to tell that it is a viable system for controlling administration choices and executing conservation methodologies.

3.12 The Relevance and Application of Theories to the Current Study

Digital Preservation Capability Maturity Model was adopted as theoretical framework that guided the study. This theory guided on the improvement of the study instruments thus questionnaire, interviews and observation guidelines. The model has 7 components which were studied to assess Botswana Public Service capacity to preserve and give continuous access to digital records. The components of the model that were very significant for the investigation were policy, strategy, collaboration, technical expertise, ingest, storage, integrity. This model was chosen to guide the study ahead of other models because it will assist the ministries to assess their level of maturity towards preservation of digital records in terms of the skill, experience, readiness and capability at a given level or stage. The model can also be used by ministries to compare themselves to other organisations and be able to identify their strengths and weaknesses as well as identify strategies on how to improve their capabilities.

3.13 Chapter Summary

This chapter provided the concept of literature review delineating its characteristics. In the setting of digital preservation the study discussed digital preservation infrastructure in different countries. The chapter notes that for digital information to continuously be accessible in future, there is a need for good infrastructure. Digital preservation systems and trusted advance repositories were discussed. The chapter has also demonstrated that it is vital for digital preservation systems to be compliant with international standards. Furthermore, the chapter discussed security and ease of access of digital records. It has shown that it is necessary to have appropriate technologies and access authorisations to be able to open digital information. Lastly the chapter

discussed the Capability Maturity Model as the model that can be trusted and used in the Botswana public service. The model has the capacity to assess the capability for keeping accurate, accessible and trusted information for future reference.

CHAPTER 4
RESEARCH METHODOLOGY

4.1 Introduction

This chapter presents the research methodology used in the study. Goundar (2012:10) defines research methodology as the application of various methods, techniques and principles in order to create scientifically based knowledge by means of objective methods and procedures within a particular discipline. Research methodology guides several aspects of the study such as; directing the collection of data to address the research questions as well as how to carry out the data analysis (Tashakkori and Teddlie 20019). Kalusopa and Ngulube (2011) see it as the 'blue' print, in that it explains how the research will be answered, perfectly fills in as a framework between the research questions and execution of the investigation as well as informing the researcher how to generally conduct a particular study.

4.2 Research Paradigm

The term worldview or paradigm has been seen diversely by different researchers. Kalusopa and Ngulube (2011) portray ideal models as human turns of events, which oversee first guidelines showing where the analyst is coming from to construct significance inserted information. Paradigms are thus important because they provide beliefs and dictates, which, for scholars in a particular discipline, influence what should be studied, how it should be studied, and how the results of the study should be interpreted (Kivunja and Kuyini 2017). The worldview characterizes a specialist's philosophical direction and this has critical effects for each choice made in the study interaction including decision of system and techniques. Schwandt (2001) is of the view that a worldview is a common perspective which addresses the convictions and qualities as an order that guides how issues should be settled. In differentiation to the view that a worldview is, by its actual nature, amazing and the comprehension of the human keenness, it is accepted that the insight,

by its extraordinary nature, is more broad than any world discernment on which it takes its current intellectual carriage (Aliyu 2014:79). Guba (1994) has made an insights contribution to articulating and distinguishing opposing paradigms of investigation.

Ideal models perceive and clarify basic hypothesis, constructivism, positivism and post-positivism as the key standards that encompass research. Moreover, a research worldview is a comprehensive arrangement of interrelated practices and imaginations that describe the idea of enquiry along these three measurements. A few researchers have indicated that there are different research ideal models that may guide and shape a research strategy and can be adopted (Kalusopa and Ngulube 2011; Cresswell and Cresswell 2018).These incorporate yet are not restricted to: positivist, interpretive, and even minded standards. This investigation was guided by the logical worldview. The procedure sub-segment clarifies every one of these standards and shows why the practical worldview was discovered fitting for this specific investigation.

4.2.1 Interpretivism Paradigms

The interpretivists accept that the world is a social one and is built by individual and in that way is not the same as the universe of nature (Burstein et al 2002”30). As indicated by Willis, Jost and Nilakanta (2007) this paradigm looks comprehensively to a specific setting in which the truth is socially built consequently known as constructivist. McQueen (2002) on the other hand is of the view that interpretivists see the world through a ‘progression of individual eye’ and pick members who ‘have their own translations of reality to envelop the perspective. Interpretivism paradigms do not place much emphasis on quantitative research methods. All things being equal, as indicated by safeguards of interpretivism, subjective techniques are congenial methods for looking at the real world. Thanh and Thanh (2015) express that interpretive scientists do not look for the solutions for their investigations in inflexible manners. They rather approach the truth from

subjects, commonly from individuals who own their experiences and are of a particular group or culture. This means that interpretivists use inductive reasoning and favour naturalistic inquiry, where field work takes place in the natural setting and are concerned with meaning of things (Chowdhury 2014).

Enc (1999:2) states that interpretivism is utilized by scientists who vary from positivist examination and it is regularly alluded to as heuristic. While positivist specialists start their examination with a theory, interpretivists utilize more open-finished exploration questions. Likewise the principle center is around subjective information from which the scientist will decipher implications. Besides, interpretive investigations are frequently idiographic, utilizing little quantities of members. This is on the grounds that the reason for existing is not to sum up but rather to investigate the implications which members put on the social circumstances under scrutiny. Willis (2007) states that interpretivism normally hopes to grasps a specific setting and the main conviction of the interpretive worldview is that the truth is socially developed. Interpretive assessments hope to examine social classes' experiences and their viewpoints or perspectives of these experiences. Interpretive examinations consider investigating groups of people and their encounters as well as their perspectives or points of view of these encounters. Interpretive examinations are commonly inductive in nature and regularly connected with subjective ways to deal with information. Interpretive examination is viewed as more emotional than objective.

Willies et al. (2007:110) is of the view that the objective of interpretivism is to look at subjectivity and interpretivist and avoid the likelihood that target research on human direct is conceivable. Interpretivist researchers search for strategies that enable them to appreciate all around the relationship of people to their flow condition and the role that people play in making social texture of they are a section. Interpretivists acknowledge an understanding of the

setting whereby any kind of investigation is guided as the fundamental to the interpretation of data aggregated, a divergence from positivists who regularly recognise only one right answer. Interpretivism is impressively more comprehensive, because it recognises various viewpoints of different individuals from different social occasions. Specialists accept that interpretivist worldview dominatingly utilises subjective strategies (McQueen 2002 & Willis 2007).

Criticisms of interpretive paradigms exist in a limited way. Contentions range from the concerns about false consciousness to the relativism of the worldview. Cohen and Morrison (2007) express that, no particular individual can have definite information on anything over a specific section of society in which they participates. The duo argue that there still remains the task of making into clear and comprehensible body of knowledge that which is just known in a fractional manners by actors themselves. According to Cresswell (2009:4) qualitative is a means of discovering and understanding the meaning individuals or groups credit to a social or human issue.

Qualitative research methods are found to be suitable as researcher gathers participants knowledge and their experiences within the field. However, some argue that the use of quantitative research is not productive as it describes the world in numbers and measures instead of words. All things considered, the researcher will gather ‘depth’ and ‘insight’ information through statistics that are frequently used in quantitative methods. Punch (2009) states that qualitative data is considered rich and in-depth as the researcher collects data through the process of deep attentiveness of empathetic understanding. Cresswell (2003) alludes that the researcher will want to understand the world of the participants by acquiring knowledge from their experiences, beliefs and backgrounds. The above analysis of researchers has to a large extent extended

the researchers understanding of the connection between interpretivism and qualitative methods.

4.2.2 Positivist and Post Positivist Paradigms

According to literature, Auguste Comte introduced positivist paradigm and its assumption was that scientific knowledge can be tested or checked through empirical observation and consistent analysis of what has been observed (Babbie 2017:34 and Cresswell 2014:7). Contrary to interpretivism, positivist consider research as a process characterised by measurements, objectivity, standardisation and representativeness, in which information is found and not created by people using their own ideas. The emphasis of positivism is on measurement of relationships between things to prove a hypothesis (Creswell 2014:7 and Ryan 2006:14).

Post positivism is premised on suspicion created after positivism, which challenges positivists feeling that the reason of something is a resolute by its results and this is the same as in experiential research. The studies which utilise the post-positivistic assumption focus on understanding and interpreting rather than on prediction and control (Creswell 2017:7).Contrasting positivism, post-positivism attempts to falsify or disprove rather than prove or refute a hypothesis (Bertram & Christiansen 2014, 23). Post-positivist research puts emphasis on the meaning and the creation of new knowledge. That is, developments that seek to change the world and contribute towards social justice. There are various characteristics of post positivism research such as: research that is comprehensive rather than specific; preference for an array of ideas that qualify as research; that theory and practice cannot be separated; the view that theory is a fundamental aspect of research. Post positivism research also holds that the very thing that motivates researchers is essential and key to the enterprises and that without the correct tools for collecting and categorising data research cannot ne comprehensive (Schratz & Walker 1995:3).

According to Cresswell (2014) post- positivists are the same as positivists as they both believe that there is a reality autonomous of reasoning that can be studied scientifically. Basically genuineness in any case, perceives that perceptions may include blunder and that hypothesis can be adjusted. In the positivism or post positivism paradigm, the main point is to anticipate results, direct a theory or discover the strength of connections between factors or a circumstances and logical results relationship (Kawulich 2012:9).

Cresswell (2014) states that post positivist reveals a deterministic way of thinking whereby causes presumably determine effects or results for instance, issues analysed in tests. Post-positivism is not attempting to replace a more secure and firm foundation as an option in contrast to positivism, rather it strives to create an awareness of the complexity, historical contingency and fragility of the practices that we invent to discover the truth about ourselves (Lather 1991:7). Post – positivism is depicted by researchers own speculations, characteristics, enthusiasm and legislative issues whereas positivism contemplates the universe of assessment separate from experts depiction for standardization. The main difference between positivism and post – positivism is the last oddballs the positivist thought of knowing reality by asserting that reality can be approximated (Bertram and Christiansen 2014:24).

4.2.3 Pragmatic Paradigm

The pragmatic paradigm is a world view that sees research as a continuous process rather than an elective that stays in reverse situations instead of two limiting and generally irrelevant shafts of either objectivity and subjectivity (Wahyuni 2012:71 & Goles and Hirschheim 2000). Kivunja and Kuyini (2017:35) and Wahyuni (2012:71) express that sober minded worldview advocates for the utilization of quantitative and subjective information and empowers them to better understand social reality or human conduct. Maxcy (2003) is of the view that the practical person researchers totally dismissed the

idea that sociology request can get to the truth exclusively by utilizing a solitary scientific technique. This indicates that this worldview recognises various methods of understanding the world and directing examination, and along these lines there is outstanding purpose of view which provides the whole picture hence there might be various real factors. Hothersall (2019) points out that for realists, a request in both public activity and research is effective only on the off chance that it accomplishes its purposes. Morgan (2014), Cresswell and Clark (2011) state that this worldview is related to a blended system. Pragmatism is a worldview which professes towards overcoming any barrier between the legitimate procedure and the structuralist direction of more methodologies and the naturalistic techniques and the freewheeling heading of more current methodologies (Creswell 2013; Creswell and Clark 2011). Practicality as an exploration theory, asserts that there are numerous methods of deciphering the world and undertaking research. It has additionally concurred that there is no single perspective which can actually give the whole picture and that there are numerous real factors in examination (Bryman and Bell, 2011: 32).

Kivunja and Kuyini (2017) states that there are a few approaches utilized in this worldview and these are:

- Naturalist approach
- Narrative request
- Case study Phenomenology
- Ethnography
- Action Research
- Experimental strategy
- Quasi-test philosophy and
- Causal near philosophy

Hothersall (2019) states that logic gives an encounter created activity focused structure in which motivation behind examination is to assist in addressing the concerns of managing our knowledge and experiences from the how we pragmatic perspective. Kaushi and Walsh (2019:10) show that the pragmatist perspective aides in uniting scientific and humanistic areas of comprehension. It helps experts in concentrating on fundamental worries in dynamic practice circumstances. Borden (2013) states that professionals can utilize the originations of practicality as arranging points of view for basic reasoning and dynamic, all things considered, practice circumstances (Borden 2013). Logic by no means considers information as final, widespread or incomparable. For pragmatic individuals information is never finished or amazing the way things are. All things considered, information is consistent in an interaction that can be changed and improved. Creswell (2018:5) points out that that the research approaches are guided by paradigms. Many researchers have stressed that pragmatism can provide a philosophical justification for the mixed research approach. For example, Mitchell (2018) reports that realism is the philosophical accomplice of mixed research approach as its fundamental suppositions give the substance a blending research techniques.

Creswell (2014) on the other hand observes that sober mindedness is the reasoning which allows blending standards, expectations, methods as well as strategies for information assortment and examination. When utilizing a blended strategy the analysts need to express their philosophical or paradigmatic positions plainly to have the option to legitimize their methodological options (Cameron, 2011). It is important to do as such as this will permit the analyst to conceptualise the ontological, epistemological and axiological positions for logic such that joins both the quantitative and subjective ideal models' perspectives as two coordinated, not clashing ways of thinking.

The common sense worldview was utilized in the examination since it properly connected to the blended strategy approach which was conveyed for this investigation. The perspective that braces the blended strategies approach is realism. This investigation seeks to comprehend the status of computerized safeguarding across the different chosen services in the public service in Botswana. Simultaneously the investigation inspected every service as a contextual analysis. This inferred that the realistic worldview gives the possibility to explore complex issues of evaluating dependability of government vaults regarding exactness, credibility and unwavering quality for compelling e-government conveyance too. The logical worldview aided and controlling the right exploration questions and issues identifying with advanced protection guidelines, techniques, arrangements, access, security, cooperation and specialized mastery in government services inside the setting of e-government. All in all, this worldview gave a generally extensive picture in occurrences where a solitary exploration strategy couldn't address the current wonder (Ngulube, 2019:425).

4.3 Research Approach

A research approach is a plan that describes detailed methods of data collection, presentation and analysis (Cresswell 2014) . The qualitative, quantitative and mixed method are the three commonly used approaches in research. In the proceeding sub-sections, the three research approaches, their applicable worldviews, research designs, methodologies and major differences are discussed in detail for this study.

4.3.1 Quantitative Approach

According to (Watson 2015) quantitative research encompasses a range of methods concerned with the systematic investigation of social phenomena, using statistical or numerical data. Aliaga and Gunderson (2002) explains that a quantitative approach involves clarifying phenomena by gathering mathematical information that is dissected utilising numerically based

strategies (specifically measurement). Quantitative research tends to ask the "What'' of the program. It utilises mathematical information and analyses using numerical based strategies. Quantitative data depends on exact estimation utilising organised and approved data collection instruments like closed ended questions, rating scales and behavioural responses. This approach was chosen as it depicted the digital capability maturity readiness of ministries in terms of the stages as explained under the maturity model section in chapter 3, figure 3.1. In addition, this approach enhances the assessment of storage areas and access of digital records by users. This was done to assess ministries ability to preserve and access digital records.

4.3.2 Qualitative Approach

Cresswell (2011) is of the view that qualitative research covers a wide scope of techniques and philosophies. The main purpose is to build significance through interpreting the views (which can be emotional, unbiased or both) from the respondents of the study (Bhattacherjee 2012). This type of information can be gathered through in-depth interviews, case studies, participant observation, field notes and open ended questions. A qualitative approach incorporates focus groups, group discussions and interviews.

Qualitative exploration strategy was used in the study due to the following reasons:

a) it started on the idea of value which is important for understanding the idea of things (Richards 2006).

b) it gives respondents opportunity to be able to express themselves using their own words rather than giving the various fixed answers or responses as in the case of quantitative methods (Krauss 2005).

c) to explore the objectives of the study. This means that the approach was chosen as it assisted the researcher in understanding the

management of digital records with the strategies to prolong their life time from the participant's opinions as well as to determine their efficiency in assisting implementation of e-government.

d) lastly the strategy was designed to be used as an assessment tool for the management and preservation of digital records so that they are available and continuously be used in future. Qualitative examination depends on relativistic, constructivist ontology that sets that there is no target reality henceforth making qualitative approach accepted in the study.

4.3.3 Mixed Method Approach

(Flick 2017:46) alludes that these days mixed method technique has made a blasting field of methodological and hypothetical discussions. The mixed method technique is combined with quantitative and qualitative procedures to acquire an expansive viewpoint on an issue. This methodology utilises multiple sorts of information (Ngulube 2019:432). Mixed method research takes a gander at various methodologies for collecting and analysing data and gives the most ideal comprehension of a research problem.

Ponce and Pagan-Maldonado (2015) recommend five potential areas of focus in the research process to coordinate qualitative and quantitative methodology as follows:

- The first step is the preparation stage where the research plan is created. In this progression, the researcher explains what to explore and the joined two will be utilised.

- This is the step where examination inquiries from quantitative and qualitative methodologies are integrated to control the researcher in discovering all the complexities of the problem studied.

- The utilisation of quantitative measurements with qualitative research to produce quantitative and qualitative data for the research problem.
- The mix of quantitative and qualitative information examination.
- The last step in the presentation of the study findings of the joined qualitative and quantitative information.

Marutha (2019:421) states that the mixed-method research involves an equivalent combination of more than one method, which is quantitative and qualitative in structure. For example, what warrants a mixed research approach may be; completely open ended questions, qualitative interview method, mixed with closed ended question and a quantitative questionnaire. Cresswell and Plano Clark (2011) shows that the general reason and central premise of mixed method research has various suspicious methodologically.

Tonkin-Crine et al. (2016) saw that mixed methods are usually utilised, nonetheless; information is not frequently combined to investigate the complementarity of findings. Ngulube (2019:430) states that the root of mixed method emerged from a paradigm of wars that expected that reality and constructivism were not equivalent and mismatched when addressing research questions.

In the literature reviewed, it is apparent that mixed methods designs and strategies have been explained in several ways. For example, Creswell (2014); Kalusopa (2011); Ngulube, Ndwandwe and Mokwatlo (2009) outline three particular kinds of mixed research approaches, namely:

- Sequential techniques; whereby qualitative data collected and interpreted before the interpretation and analysis of the quantitative data.
- Concurrent techniques data is gathered utilising qualitative and quantitative procedures at the same time (for example giving the

respondents a questionnaire which has both closed ended and open ended questions: and

- Transformational strategies utilising a hypothetical point of view to guide and drive the whole study design.

Concurrent mixed methods involve arranging and utilising both the core just as supplemental parts simultaneously from the beginning of the study. On the other hand sequential mixed methods involves utilising the core segment first, either quantitative or qualitative; finishing the study; conducting the supplementary segment later to upgrade the study and reporting findings in one report. The two designs that are core to the mixed methods are convergent and exploratory designs (Cresswell and Plano Clark 2018). They describe convergent design as independent and separate the analysis of quantitative and qualitative collection and combines the two to check whether they supplement one another. This gives an explanatory sequential design as where data was collected is in order by starting with qualitative data. (Ngulube 2019:438) advises that the respondents of the two designs should be different. Various techniques utilise various methodologies in separate studies to address similar research questions and publishing the results independently; for example when a study shows surprising findings, the researcher may lead a different report utilising an alternative methodology (Ngulube 2019).

Ngulube (2019:439) indicates that the aim of explanatory approach is to utilise the outcomes from qualitative responses and explain the results from quantitative using quantitative appropriate tools. The issue which is explored by utilising explanatory approach, should be quantitatively arranged, the significant factors have to be known and the researcher must have resources including time to conduct the research in two stages. Morse and Niehaus (2009:17) have also identified the emergent design as another sequential

method. This is depicted as the strengthening segment that can be added while the core segment in the study underway is finished and the researcher understands the current study is lacking and that additional information will improve the research. In this particular case, the sequential is arranged and remembered in the study, while the emergent design is not arranged yet is viewed as vital during the study period and can be integrate a supplementary component. This underscores the fact that in research literature and practice, there are studies that can use multiple methods to answer a single research question.

Accordingly, it is prudent that mixed strategy approach must not be confused with multiple methods research (Ngulube 2019). Multiple methods utilises various methodologies in independent studies to address similar research questions and publish the results separately; for example when a study shows sudden findings, the researcher may lead a different report utilising an alternative methodology (Ngulube 2019). A mixed method approach design was used in the study. This implies that the researcher gathered qualitative and quantitative data simultaneously and consecutively to have one type of information assume a supportive role to the other. The study compared digital preservation capability maturity readiness, assessed the preservation strategies used and digital preservation infrastructure in terms of e-government. When data collection began the researcher started by drawing a schedule of interviews as per the agreed dates with Senior Managers of each ministry and followed the schedule. The researcher reviewed the records management policies, procedures, strategies, standards, records formats, reliability and trustworthiness of the repositories after completing the interviews, administering questionnaires and observations. The researcher interviewed respondents on the preservation infrastructure and at the same time observed how they created digital records, the formats used and how they classify and transfer digital records into the repositories. The same questions were also on

the questionnaires and this was done so that the responses complement each other. This was also done to get a deeper understanding and clear picture of the digital preservation infrastructure.

4.4 Research Design

The primary target of a research design is to guarantee that the information gathered empowers the researcher to viably address the research problem sensibly and explicitly (De Vaus 2001). Kumar (2005:84) on the other hand, states that research design has two primary functions; the first identifies with the identification and additionally development of systems and strategic courses of action needed to attempt an investigation, and the second accentuates the significance of value in these techniques to guarantee their legitimacy, objectivity and precision A research design therefore, subtleties what researchers needs to complete project. It includes multiple research decisions whereby data is gathered and analysed to guarantee that research questions are answered (Polit and Beck 2004:49). In planning a research study, a researcher should settle on a series of decisions along four measurements consequently; the objective of research, the paradigm guiding research, the context or situation, tools used to gather and analyse data and these dimensions should be woven together in a cognizant research design such that will maximize the validity of the findings (Durrheim 2006:37). Orodho 2003 adds that there are different types of research design. These are narrative, ethnographic, descriptive, experimental, correlation, grounded theory, survey, case study, cross cultural, action research, and mixed methods. This study concurrently utilized the cross sectional survey and the qualitative case study designs based on a mixed methods.

4.4.1 Cross Sectional Survey

The survey research design has been extensively used in research for so many years as a data collection tool in social sciences. Cross sectional survey design is commonly used design in research. According to Cohen, Manion and

Morrison (2007:213) states that by utilising this design, the researcher collects data at the same time producing a snapshot of the population of the study. Comparatively it has been observed that the cross-sectional studies are easier to conduct rather than longitudinal studies due to the fact that the researcher can collect all the needed data at a single time. Conversely, a researcher who leads a cross sectional study should gather information over a protracted period and constantly loses respondents along the way in the light of the fact that they move to unknown locations or because they are no-longer interested in taking part in the study.

The researcher used a cross sectional design by sequentially collecting data through interviews, questionnaires, observations and document reviews. The researcher made a schedule for interviews with the Senior Managers. Moreover, the researcher administered the questionnaires to ICT officers and Records personnel. This was done by appointing with the Records supervisor to give them the questions and collect them back on behalf of the researcher. Upon return of the questionnaire to the researcher, observations were conducted and each ministry was observed in one day. Lastly document review was conducted. This was meant to explore how digital records were created and managed; establish availability of digital signatures, to investigate how records were classified and given retention periods. The review also established repositories access, accuracy, reliability and authenticity of records, as well as availability and implementation policies, procedures and guidelines.

4.4.2 Case Study

Case study method is usually utilised in scholarly world for researchers (Baskarada 2014). Yazan (2015) states that in qualitative research, case study is one of the commonly utilised approaches. Zainal (2007:2) indicates that case studies investigates constantly contemporary real-life phenomenon

through detailed contextual analysis of a limited number of events or conditions, and their relationships. The objective of a case study is to do intensive research on a specific case, such as individual, group, institute, or community. Yin (2003) outlines the reasons for using this approach;

- the emphasis of the study is to answer "how" and "why" questions;
- the conduct of those engaged in the study cannot be controlled;
- context oriented conditions are covered since they are seen as applicable to the phenomenon under study or
- the limits are not satisfactory between phenomenon and context.

Yin (2003) sorts case studies as logical, or clear and separates between single, all-encompassing contextual investigations and numerous contextual analyses. Case studies are classified as intrinsic, instrumental or collective by Stake (1995). In case studies, the study questions are often of the 'how do?' rather than the 'how should' (Punch 2005). According to Ponelis (2015) case study analysis is appropriate when a researcher is attempting to establish a hypothesis from the data collected. In this study a ministry is the case. The study carried out case studies of 6 ministries in the Botswana Public Service.

4.5 Study Population and Location

All units with similar distinguishing characteristics are referred to as a population (Salkind 2011). Polit and Beck (2017:249) characterise a population as the entire set of cases in which the researcher is interested. A population is selected for qualitative studies not for the purpose of generalizability but rather to determine the types of people who are appropriate in the research. According to Cresswell (2012) a population is a group of people who share one characteristic that distinguishes them from one another. The location of the sample, according to Collis and Hussey (2013) is the environment in which the analysis is performed.

The population of the study was ten ministries at the time of the study: the Ministry of Youth Empowerment, Sport and Culture Development; the Ministry of Finance and Development Planning; the Ministry of Investment Trade and Industry; the Ministry of Transport and Communications; the Ministry of Land Management, Water and Sanitation Services and the Ministry of Employment Labour Productivity; the Ministry of Infrastructure and Housing Development; the Ministry of Nationality Immigration and Gender; the Ministry of International Affairs and Cooperation; the Ministry of Basic Education; the Ministry of Tertiary Education, Research, Science and Technology of which 6 were surveyed see figure 4.1.

In addition to the above, it is important to note that the Botswana Public Service was divided into 18 ministries following the report. The ministries are as follows; Presidential Affairs, Governance and Public Administration; Defence, Justice and Security; Finance and Development Planning; Investment, Trade and Industry; Local Government and Rural Development; Infrastructure and Housing Development ; Health and Wellness; Basic Education; Tertiary Education; Research, Science and Technology; Mineral Resource, Green Technology and Energy Security; Environment, Natural Resources, Conservation and Tourism; Land Management, Water and Sanitation Services; Employment Labour Productivity and Skills Development; Nationality Immigration and Gender; International Affairs and Cooperation; Youth Empowerment, Sport and Culture Development; Transport and Communication; Agricultural and Food Security (Government of Botswana 2016).

4.6 Sampling Procedures and Sample Size

The unit of analysis was each ministry and this study surveyed all the ministries. There were ten (10) ministries at the time of the study and 4 could

not be researched on; implying that the remaining 6 (six) were selected for this current study. The 10 ministries were: the Ministry of Youth Empowerment, Sport and Culture Development; the Ministry of Finance and Development Planning; the Ministry of Investment Trade and Industry; the Ministry of Transport and Communications; the Ministry of Land Management, Water and Sanitation Services; the Ministry of Employment Labour Productivity and Skills Development; the Ministry of Infrastructure and Housing Development; the Ministry of Nationality Immigration and Gender; the Ministry of International Affairs and Cooperation; the Ministry of Basic Education; the Ministry of Tertiary Education, Research, Science and Technology. The restricted ministries four (4) ministries were: There were 4 ministries restricted which were: Ministry of Infrastructure and Housing Development; Presidential Affairs, Governance and Public Administration; Ministry of Defence Justice and Security; Ministry of Mineral Resources; Green Technology and Energy Security.

Purposive sampling according to Ritchie, Lewis and Elam (2013) is when representative of a sample are selected with the aim of representing a category in relation to a main criterion. In the current study, the questionnaires were administered to purposefully selected records managers and officers and it assessed the status of digital preservation infrastructure in each of the selected ministries. Interview sessions were also conducted with Senior Managers, ICT Manager and Manager Human Resources and Administration. The interview guidelines assessed the strategies adopted for making sure information is accessible, complete, accurate and useable continuously for business transactions. The observation checked the level of preparedness on the Public Service in terms of digital preservation in line with legal requirements. The researcher selected participants who have sufficient and relevant work experience on the implementation of the e-government strategy and initiatives.

Within this context, the participants of this study were the senior managers, human resources and administration managers, information communication officers, archivists and records managers as depicted in table 4.1.

Table 4. 1Sample Size of the Study

Ministry/Department	Position of the Participants	Population
Ministry of Land Management, Water and Sanitation Services	Senior Managers	1
	Human Resource and Administration Manager	1
	Information Communication Manager	1
	Information Communication Officers	2
	Records Managers	10
	Principal Records Manager I	1
Ministry of Finance and Economic Development	Senior Manager	1
	Human Resource and Administration Manager	1
	Information Communication Manager	1
	Information Communication Officers	3
	Records Manager	3
	Senior Records Manager	1
	Principal Records Manager II	1
Ministry of Employment Labour Productivity and Skills Development	Acting Senior Manager	1
	Information Communication Manager	1

	Information Communication Officers	4
	Senior Records Manager	1
	Records Managers	1
Botswana National Archives and Records Services	Assistant Deputy Manager	1
	Principal Records Manager I	1
	Information Communication Manager	1
	Records Managers	10
	Senior Records Manager	1
	Senior Archivist	1
	Archivist I	6
	Principal Archivist I	1
Ministry of Investment, Trade and Industry	Senior Manager	1
	Human Resource and Administration Manager	1
	Information Communication Manager	1
	Records Manager	1
	Principal Records Manager II	1
Ministry of Transport and Communication	Senior Manager	1
	Human Resource and Administration Manager	1
	Information Communication Manager	1
	Information Communication Officers	3
	Records Managers	7
	Principal Records Manager I	1
	Deputy Manager-Management Services	1

	Performance Improvement Coordinator	1
	Project Manager	1
Total		79

Source: Field Data 2019

4.7 Research Instruments

Open and closed questionnaires, semi-structured interviews, document analysis and personal observations were used in the study. To compensate for the strengths and weaknesses of the other instruments, the researcher used different types of instruments. The researcher self-administered structured questionnaires to 54 officers and conducted semi- structured interviews to 25 senior executive officers and used observation assessment tool.

4.7.1 Interview Guides

Payne and Payne (2004) described an interview as data collection in face to face setting using an oral question and answer format that either asks the same questions to all respondents in a systematic and organised manner, or enables respondents to talk about issues in a less directed yet discursive manner. An interview, according to Gay and Airasian (2003:209) is a purposeful conversation between two people. A purposeful conversation between two or more people, according to Saunders, Lewis and Thornhill (2012:372) requires the interview to build rapport, ask concise and unambiguous questions to which the interviewee is willing to answer and listen attentively. This method is one of the most popular and effective ways for researchers to better understand their fellow humans (Denzin and Lincoln 2005).

Pickard (2007:181) points out that interviews are suitable for collection of data when the aim of the research is to gather individual opinion, beliefs and feelings about a topic or when the questions are too difficult to be asked in a straightforward manner. They are also useful in instances where more depth is

expected from the respondents, .(Gay& Airasian 2003) adds that interviews, as opposed to other data collection methods enable researchers to obtain valuable information relating to perception and feelings. According to Berry (1999), there are four types of interviews: structured, semi – structured, non-directive and focused interview. This study used semi-structured interviews which enabled the researcher to delve deeper into the interviewee's concerns beyond the open-ended questions that were pre-planned (Leedy and Ormrod 2005). During the conversation, the researcher took notes.

Organised interviews, according to Krathwohl (1993), entail a fixed order and coding of questions in which the respondent is provided with alternatives for each question, allowing for structured answer phrasing. Unstructured interviews are descriptive in nature, allowing the interviewer to select a topic of interest and formulate and order questions about it. The key benefit of organised interviews is that they are more effective. Interviewees will select a topic of interest and formulate and order questions about it. In addition, and as opposed to questionnaires, interviews yield more answers. Interviews have aided the report in determining the why of the issues discovered by other data collection methods such as observations and questionnaires (Gay & Airasian 2003).

Prior to conducting the interview sessions, the researcher created a checklist interview questions. The interview was arranged according to the researcher's and participant's agreement. The information provided by the participants was recorded in the form of notes, which were later transcribed. The interviews were meant to gain more insight and confirmation on issues regarding digital preservation strategies, accepted policy, their support for digital preservation and e-government drive. Interviews were conducted with senior management such as senior managers, human resources and administration managers as well as ICT officers at the sampled ministries. The

researcher had the ability to ask follow up questions or contribute to the conversation during the interview.

4.7.2 Observation

Observation is often treated as both a research tool and a data collection technique to be used in conjunction with a research method. It is used in both basic and applied science as well as quantitative and qualitative studies, as a data collection technique (Powell & Connaway 2004). Observation allows the researcher to see things that would otherwise go unnoticed and to find things that would otherwise go unnoticed. It also enables the researcher to learn things that participants would not openly address in interview settings or through focus group discussions and even to step beyond perception based data to personal knowledge (Cohen & Morrison 2007).

The act of documenting events or situations in which a researcher is present is known as observation. The current status of a phenomenon is determined in an empirical study by watching rather than asking (Powell & Connaway 2004). Observation takes place as events unfold, bringing the researcher closer to the phenomenon under investigation. According to Pickard (2007), 'to observe' implies to pay attention.

There are two main forms of observation; structured and unstructured. Structured observation, is used to provide systematic explanations or evaluate causal hypotheses. This type of observation is said to be a more formal approach (Powell & Connaway 2004). Structured observation entails observing behavior in terms of predetermined series of events or phenomena to be investigated. Unstructured observation, on the other hand, does not specify the elements of the condition to be studied in advance. It's a versatile technique that is particularly useful in explanatory research (Powell & Connaway 2004). When using observation as a research tool, the researcher

should keep the following in mind: What are the things that must be kept in mind? What method should be used to record the observation? How should observation be registered? And, how can observation accuracy be assured? (Kothari 2004). The researcher will not need to question people about their own behavior or the acts of others; instead, he or she may simply observe how people behave and talk. As a result, the researcher is able to gather first hand evidence, avoiding contamination of the variables standing in his or her way (Frankfort-Nachmias and Nachmias 1996:206).

Observation has a number of significant benefits. For instance, it helps the researcher capture behavior as it happens, allowing you to equate what people actually did with what they claimed they did (Powell & Connaway 2004).

Furthermore, this approach is independent of respondent's willingness to answer and, as a result, requires less active participation on the part of respondents than the interview and questionnaire methods. An observation has many drawbacks, including the cost, the limited information given, and the possibility of unforeseen factors interfering with the observation. Observer bias may exist, and the interpretation of what is observed may differ from one observer to the other. Furthermore, the observation and recording are both incomplete (Kothari 2004).

The study used formal participatory observation in all the ministries, (See Appendix J). The researcher observed the following: availability of a written plan, strategy, approved policy, technical expertise, storage, device or media renewal, security, software, implementation of the transformation of all electronic records from records creators, metadata and access, other tools which can be used for creation of records and store digital data. This assisted the researcher to know whether the ministries were ready to adopt e-

government initiatives such as digital preservation by the use of digital preservation maturity model.

4.7.3 Questionnaires

A questionnaire is a document that contains questions and other types of items designed to collect data for review and is performed by the respondent directly (Babbie 2004). The questions must entice the respondents to provide the data required (Frankfort-Nachmias & Nachmias 1996:250). Respondents read the question in a questionnaire and interpret what is expected of them (Kumar 2005:126). Good survey questions provide the researcher with accurate and reliable data while ensuring that respondents understand the question and that their responses are meaningful (Neuman 2006:277).

The material, structure, format, and sequence of questions are all important factors to consider when creating them (Frankfort-Nachmias and Nachmias 1996:250). According to Fowler (2002) developing a good questionnaire entails choosing the questions required to address the study's research questions and testing them to ensure they can be asked and answered as intended. Typical questionnaires use statements and questions which enable a researcher to be more creative when designing measuring instruments (Babbie 2004). A good questionnaire should be well structured in order to generate accurate measurements of the variables (Fowler 2002). Pre-survey assessments or pre–tests may help improve the consistency of the questionnaire design.

In any study, involving human subjects, a questionnaire is the most popular data collection tool (Pickard 2007). Questionnaires are commonly used and useful instruments for collecting survey data since they provide organised, numerical data. Questionnaire can be administered in the researcher's absence and are often relatively simple to analyse (Blaxter, Hughes & Tight 2010).

The benefits and drawbacks of questionnaires have been well reported in literature (Babbie & Mouton 2001). The questionnaire is relatively inexpensive when compared to other data collection instruments and it allows a large number of respondents to be surveyed in a limited period of time, even if the respondents are geographically dispersed (Powell & Connaway 2004). Self-administered questionnaires were used in this research because they are inexpensive and can be sent to a large number of respondents who are separated by large distances at the same time. Structured questionnaires, on the other hand, have drawbacks such as the inability to prompt, investigate and obtain additional data from respondents (Bryman 2012:235). These limitations were ironed out with the help of experienced researches during pre-testing. In other words, the questionnaires were tested with UNISA records and information management PhD students as well as the promoter of the study. The adjustments were made in response to the test groups input.

4.7.3.1 Types of Questions

Just one part of creating a survey questionnaire is the content of the questions. In general, there are two types of questions that are used in questionnaires: open ended and closed ended (Mugenda & Mugenda 2003:72). There are organised or closed questions, as well as unstructured or open ended ones (Cohen & Morrison 2007). The intention and practical constraints of a research project influence whether a researcher uses an open or closed query (Neuman 2006:287; 2007:170).

4.7.3.2 Closed Questions

Closed questions enable participants to choose from a limited number of predetermined answers by the researcher (Johnson 2008). They also allow for comparisons between groups in the study (Oppenheim 1992:115). Closed questions on the other hand, do not allow respondents to add any comments, qualifications or examples of the categories and there is a possibility that the

categories are incomplete and biased (Oppenheim 1992). Closed ended questions limit the options available to the respondents (Cohen & Morrison 2007).

4.7.3.3 Open-Ended Questions

Kumar (2005:132) defines open ended questions as those that offer the respondent full freedom of response. Open questions allow respondents to answer as much or as little as they want, and are especially useful for investing complex issues for which clear answers are unavailable (Cohen et al 2007:321 & Johnson 2008). Respondent should write a free account in their own words, justify and qualify their answers and escape the limitations of pre-test answer categories by using open questions (Babbie 2004).

To answer the study research questions, the researcher used both closed and open ended questions. The researcher used the Records Managers in sampled ministries to administer the questionnaires because the sample size was too big and the researcher could not manage to collect data alone due to time constraint as the main resource. Prior to administering of the questionnaire, the researcher liaised with records managers of the ministries which granted permission to inform them about the questionnaires and what the purpose of the study is. The questions were administered to information technology officers and records officers.

4.8 Reliability and Validity

Reliability and validity, according to Kalusopa and Ngulube (2011) are ideas that have evolved and are founded in the positivist tradition and quantitative exploration. Winter (2000) states that reliability and validity are instruments of a basically positivist epistemology. Bhattacherjee (2012) characterize dependability as "how much the proportion of a build is predictable or trustworthy", that is, if a similar size of estimating is utilized by an alternate

analyst on a comparable report, or if a similar scale is utilized a few times, a similar outcome will be accomplished without fail. Validity was described by Gay and Airasian (2003) as ‘how much a test calculated what it could calculate’. William (2006) adds that reliability has to do with the quality of estimation. Therefore, in regular sense, reliability is the 'consistency' or 'repeatability' of the measures.

As indicated by Leedy and Ormrod (2010), content validity alludes to the degree to which the estimation of an instrument is a delegate of an example being measured. This implies that for data collection instrument to be viewed as suitable for content validity, it ought to have questions that cover different perspectives, attributes and abilities that are key to the region of study and in right extents. One approach to accomplish dependability and legitimacy in subjective examination is through methodological triangulation. In this investigation, surveys, perception agenda and meetings questions were utilised to address advanced protection and e-government drive angles as they satisfied the substance legitimacy necessities. The degree to which an instrument estimates characteristics that are not easily seen with unaided eyes but are assumed to exist based on examples of people’s behavior is known as construct validity. In this analysis, the researcher pre-tested the instruments to see whether they needed to be modified further and feedback was gathered and incorporated into the instruments.

4.9 Pre-testing the Instruments

Pre-testing the interview guide, according to Ngulube (2005:136) is one of the devices that can be used for material validation. It is common that he errors can still be identified, no matter how carefully a researcher designs a data collection instrument such as interview guides. Babbie and Mouton (2001) advise that the only way to avoid such errors is to completely or partially pre-test the meeting guide in full or part. The aim of the pre-test is to see how the data collection instruments perform in real world scenarios.

Furthermore, pretesting allows respondents to identify questions that are difficult to answer, have vague directions or are irrelevant or incomplete questions, as well as provide general feedback on the instrument (Powell & Connaway 2004). Students pursuing a PhD in records and information management at UNISA were used to test the system. In addition, the researcher gave the promoter the questions to ensure that they were researchable. The questions were given to a small group of people who found some that were too technical for them to answer. The technical questions were incorporated into the questionnaire for ICT officers. The researcher applied the improvements after the instruments were corrected. Any of the modifications were made to eliminate uncertainty and vagueness.

4.10 Document Search and Analysis

Document analysis, according to Flick (2011) is a quantitative study of subjective data that involves checking frequencies and sequencing. Kalusopa and Ngulube (2011) on the other hand state that documentary analysis is another source of data collection that can improve the use of questionnaires, interviews and observations. Patton (2002) observes that a variety of documents can form part of the analysis. These include, and are not limited to; composed material and various files from the cases under investigation, public records (political and judicial papers, governments documents, newspaper accounts, television scripts, yearbooks and minutes of meetings) private documents (medical history, emails, diaries, school records, personal journals and memoirs), interview transcripts prepared from the video records, photos and documents produced by the researcher from the field notes.

To classify and pick documents that are useful and important to the study's objective, the researcher used inductive content analysis. Documents such as sour documents, digital preservation policies, standards, strategic plan and guidelines were requested by the researcher. The knowledge gathered by

questionnaires, interviews and observations was enriched by the analysis of these records.

4.11 Data Processing and Analysis

Data analysis according to Leedy and Ormrod (2005) is the method of organizing, categorising and summarizing data in order to address research questions. Data analysis is one of the most important aspects of multi-method research because it contributes significantly to the study's findings and generalisation. It deciphers the context and comprehension of different data sets that may be obtained during a research project (Adu 2015:146). Data analysis techniques as eloquently stated by Neuman 2003 enable researchers to summarise findings in order to find answers to research questions.

The classification and interpretation of data obtained in the field is referred to as processing and analysis (Kalusopa & Ngulube 2011). 'Data analysis methods help researchers to summarise findings in such a way that they can find answers to research questions,' (Tshotlo and Mnjama, 2010). Hatch (2002:148) puts it succinctly 'Data analysis is a systematic quest for significance.' It is a method of analysing qualitative data so that what is learned can be shared with others. Researchers may see patterns, identify trends, discover relationships, create explanations, mount critiques or generate theories. Synthesis, assessment, description, categorization, hypothesizing, comparison and pattern finding are often used. Data analysis often entails what Wolcott (year) refers to as 'mind work'. To make sense of qualitative evidence, researchers often use their own intellectual capacities.

The methods for analysing qualitative and quantitative data vary (Ngulube 2015). The aim of the analysis is to produce accessible and valuable knowledge. Regardless of whether the data is qualitative or quantitative, the study may be used to: define and summarise data; identify relationships between variables; compare variables and identify differences between

variables and predicted outcomes. Other analysis methods include the use of computer software including text storage in an organised database, coding, field notes, text search and retrieval, content analysis, data display, memoing and theory building.

Constant comparison research was used to analyse data of qualitative nature obtained through interviews and observation. This is the most commonly used type of analysis for qualitative data. First and foremost, the researcher became acquainted with the collected data by reading and re-reading the entire data set, In addition, the researcher jotted down any ideas that came to mind and wrote summaries of each transcript or piece of data analysed. The researcher coded questions in order to condense all of the knowledge into key themes and topics that shed light on the research questions.

The researcher then created a coding system, which included a list of codes that were used to categorise the information into descriptive topics. The researcher abstracted themes from the coded after all of the material was coded. In addition, the researcher wrote a code heading on a small piece of paper and spread them on the table to get sense of the different codes in order to group them together into themes. The quantitative data collected through open ended questionnaires and observations was proof read to ensure that all responses, extreme values, handwriting errors and the completeness of the data were correct. Each questionnaire was data coded and an observation checklist was used to analyse the data using statistical package for social sciences (SPSS) analytical software. When it came to analysing quantitative research, this program was dependable and easy to use. In this analysis, the distribution of variables was represented using bar charts, pie charts and figures.

Conceptual and thematic analysis was used to examine the results. This research entails defining definitions and tallying them to determine whether or not a concept exists. Despite their variations in procedures, quantitative and qualitative analysis use similar measures to achieve their goals according to Cresswell (2007). Quantitative data (questionnaire) were statistically analysed in this study. The information gathered through semi-structured interviews, document analysis and personal observation were organised systematically as per the objectives of the study, which were then divided into major coding categories and sub categories (Ngulube 2015:5). Questionnaires, observation, interviews and document analysis were all used to supplement each other's weaknesses. The limitations of the data collection instruments used in the study were overcome with the aid of triangulation.

For one study, the two sets of data were triangulated and combined into a single interpretation. Triangulation according to Honorere (2016) is the use and combination of multiple research methods in the study of the same phenomenon. This was done to supplement the knowledge gathered from the respondent's results. However, the information gathered through document analysis, observation and interview in this study was focused on assessing the digital infrastructure and trustworthiness of the digital records in repositories. The responses from these answered the research questions of the study and were integrated in order to overcome the weaknesses identified within those instruments used.

4.12 Ethical Considerations

According to Halai (2006) sound study research is a good and moral undertaking and should not be concerned with ensuring that the rights of those participating in an investigation are not jeopardised as a result of the investigators completion. The field of research ethics is governed by a set of

principles that assist experts in conducting moral investigations. Research ethics consider how scientists should handle people who form the subjects of their studies, as well as whether there are any behaviours that should not or unquestionably be compared to them (Bell 2008:87-88).

Participants should not be forced to participate without their permission should be obtained (Creswell 2003).When conducting research, a variety of ethical issues privacy, confidentiality as well as informed consent must be taken into account. A researcher must clarify how they would deal with issues of privacy and confidentiality. Participants and study location identities must be protected as insisted by codes of ethics (Denzin & Lincoln 2000:139). Creswell (2003:185) recommends masking names of individuals, places and activities.

Furthermore, according to the Republic of Botswana Guidelines for Application for Research permit (2004:3), research application should be directed to the government ministries whose portfolio the research falls under. In January 2019, the researcher applied for research permit (See appendix A). The researcher informed the participants that the information they provided would be used for academic purposes. Furthermore, the researcher advised them to volunteer as the results would help the entire country. The study follows ethical principles outlined in section 1.8 of Chapter One. The researcher did not reveal any of the respondent's personal details. The respondents were also told that the information collected would be kept private and used for academic research purposes. To prevent plagiarism, all the references used were cited and acknowledged. The information collected was then analysed, interpreted, discussed and presented.

4.13 Evaluation of Research Methodology

Assessing research strategy involves scrutinising the fittingness and sufficiency of the approach used to lead an investigation against the accessible alternatives just as feature to the limits of the procedure utilized. Maluleka (2017: 91) states that assessing a research system is fundamental since it makes it vital for the specialist to assess strategies engaged with directing the investigation to enlighten its shortcomings. Ngoepe (2012:116) for instance, prompts that in light of the fact that no exploration strategy is great, specialists need to give a decent viewpoint of the qualities and impediments of an examination. This is implied as an alert to different researchers that may wish to reproduce the examination. The procedure sub-area present the strength and shortcomings of the technique received in this current investigation.

4.13.1 Strength in the research methodology

The investigation was guided by logical worldview which joined both subjective and quantitative with the goal that the techniques could supplement one another. Triangulation was utilised to upgrade dependability of the information and wipe out the shortcomings experienced. The realism worldview is more qualified for noting the "what" and "how" research questions (Mosweu, 2018:80). Creswell (2014:10) places that the logical worldview centers on the exploration question and utilising all methodologies accessible to respond to it, consequently, what works is focal. The realistic perspective is consequently proper as it takes into account the utilisation of various perspectives, suspicions, information assortment and examination.

The analyst additionally figured out how to test all the instruments as a method of checking whether they will yield positive reactions by offering it to the specialists inside the calling, later submitting to the chief. The scientist noticed the accessibility of virtual products utilized, designs, arrangements, procedures and guidelines in protection of computerized records per service overviewed. The specialist figured out how to associate very well with the

respondents. During interviews the analyst gave the respondents sufficient opportunity to clarify their reactions and the issues which were not satisfactory, she mentioned the respondents to rehash the appropriate response.

4.13.2 Weaknesses

Several challenges arose during data collection process for the researcher. First and foremost, senior management did not adhere to the agreed – upon times, in fact, some kept adjusting the times, resulting in the interviews taking several days to complete. Not all questionnaires administered were completed and this made the researcher to follow up respondents telephonically and physically. The researcher wanted to tape record all the interviewed respondents but could not do so as they all rejected tape recording. Therefore, the researcher had to take notes and during the time of interpreting the data collected some difficulties were encountered and so she had to phone back some respondents and got clarity.

4.14 Chapter Summary

The research design and methodology are discussed in this section. The analysis was influenced by interpretivism and post positivism which were used to establish qualitative and quantitative research questions. The research population and location as well as ethical issues raised in the study were discussed. There was also a discussion on data analysis and research evaluation. The research findings are presented in the following sections.

CHAPTER 5

PRESENTATION OF RESEARCH FINDINGS

5.1 Introduction

The results of the study which were collected through document analysis, personal observations, interviews and questionnaires are presented in this chapter. As mentioned in chapter four, a combination of qualitative and quantitative research methodologies were used to provide more systematic responses in order to account for unexpected development and explain unusual circumstances. Open- ended interviews and personal observations were used to gather qualitative data. A self- administered questionnaire was used to collect quantitative data. Quantitative data was analysed using SPSS version 24 for descriptive and inferential statistics, while qualitative data was analysed using content analysis. Graphs, maps, tables and figures have helped in the presentation of findings arising from the review of data collected for the research. Narratives are used to present qualitative results. The research questions guided the presentation of findings in this chapter.

Qualitative data were collected through open-ended interviews and personal observations. Quantitative data were collected through a self-administered questionnaire. Qualitative data were analysed through content analysis while quantitative data were analysed using SPSS version 24 for descriptive and inferential statistics. The presentation of findings resulting from the analysis of data collected for the study has been aided by graphs, charts, tables and figures. Qualitative findings are presented in the form of narratives. In this chapter, the presentation of findings is guided by the research questions:

(a) How is the status of the digital infrastructure in terms of the policy, strategy, collaboration and technical expertise in the government ministries within the context of e-government

(b) How is the trustworthiness of existing digital records in the Botswana government repositories in terms of accuracy, authenticity, reliability, security and access for effective e- government delivery?

(c) What preservation strategies are delivered by your ministry in the context of e-government?

(d) What level or stage is your ministry or departments in digital preservation capability maturity readiness?

(e) What is an appropriate framework for the assessment of the digital maturity capability in the Botswana public sector that can enhance e-government delivery?

In this chapter, the findings address (a) to (d), while the question on the appropriate framework is dealt with in Chapter 6. In the proceeding section presents the findings.

5.2 Profile of respondents and response rate

This aim of the study was to cover at least nine (10) government Ministries which currently have systems for generating and managing digital records but only 6 Ministries were surveyed (see table 5.1). The study's target population was 102 respondents from six key purposively sampled Ministries as depicted in table 5.1. There were 79 questionnaires distributed, out of which 55 were completed and returned yielding 68% response while 24 (30%) were never completed and never returned. The response rate for questionnaires was 68% which is good. In the selected ministries, there were also follow- up interviews with 4 senior managers, 4 managers for human resources and administrations, 5 ICT managers, 7 head of division's records management and 1 head of archives administration. The targeted number for interviews was 23 respondents and only 21 were interviewed resulting in 91% response rate while 2 (9%) reported that they had tight schedules while others were on

official trips. According to Babbie and Mouton (2011) a response rate of 50% is considered satisfactorily, 60% as good and 70% very good. The organisations respondents and institutions were coded in order to preserve anonymity. The respondents were coded as follows: SM 1, SM 2, and SM 3 for senior managers, ICT 1, ICT 2, and ICT 3 for IT managers, HOD RM 1. HOD RM 2, HOD RM 3 for Head of division records management, HOD A for Head of division Archives. The coding of the respondents follows no particular order.

Table 5. 1 Response rate

Name of the Ministry	Questionnaire Target	Questionnaire Response	Questionnaire Response Rate (%)	Interview Target	Interviews Response	Response Rate (%)
Ministry of Transport and Communication	12	9	75%	2	2	100%
E-government Office	10	5	50%	4	4	100%
Ministry of Land Management Water and Sanitation Services	10	6	60%	3	2	67%
Ministry of Finance & Economic Development	10	6	60%	3	2	67%
Ministry of Employment, Labour Productivity & Skills Development	7	6	86%	3	3	100%

Ministry of Investment Trade and Industry	15	12	80%	3	3	100%
Ministry of Youth Sport and Culture-Botswana National Archives and Records Services	20	16	80%	5	5	100%
Total	79	55	68%	23	21	91%

5.3 Types of systems for managing digital records

During the interview with information technology managers that were asked the type of systems that their ministries used to manage digital records. Five of them made several remarks as follows:

> ICT 1 said *'I only know the oracle systems for the management of financial transactions and human resources management system for management of officers leave days'.*
>
> ICT 2, HOD A 1 and HOD RM affirmed that *'In Botswana National Archives and Records Services we are currently implementing a national records management system called National Archives and Records Management System which has two modules thus the records and archives module'.*
>
> ICT 3 and HOD RM 4 said *'The current systems which are used are the Land Administration Procedures Capacity and Systems (LAPCAS), oracle system and the government accounting budgeting system commonly known as GABS'.*

ICT 4 together with HOD RM indicated that 'We use the Knowledge Repository Information System developed by SQL View Pty Ltd of Singapore which is a Document Workflow Management System for management of records and business systems such as the inventory management, trade licensing system, oracles for finance and human resources systems'.

ICT 5 and HOD RM 3 said that 'The ministry has expatriates employment system, government accounting budgeting system and there is no system to manage records stored on the records management unit they are managed physically'.

This was also confirmed by observations that three of the ministries surveyed were currently implementing electronic records management systems and all of them had business systems used for the creation and storage of data. It was found that the Knowledge Repository Information System was capable of managing electronic records from creation to disposition. However they were still at an infancy stage of managing digital records. In essence the system was designed in such a way that its capability ranges from managing electronic records and those generated in other systems through integration. The observations also showed that the systems do not interoperate because they are not integrated.

5.4 Creation and capturing of records

The Botswana Public Sector creates digital records in records management system and business system to provide services to the public timely. As eloquently stated by Kalusopa and Ngulube (2015:176) creation and capturing are records management processes in which data and information are created during the course of business operations and recorded in recordkeeping systems so that they can be kept as accurate as useable proof of decisions, behavior and transactions in labour organisations. Through the questionnaire,

the respondents were asked to state the types of records created, received and or stored in their ministries. Table 5.1 indicates that 31 (47%) respondents stated that they create and receive records through emails, whereas 13 (19.7%) used CD'S, while 16 (24.2%) used audio and videos and 6 (9.1%) respondents used photographs.

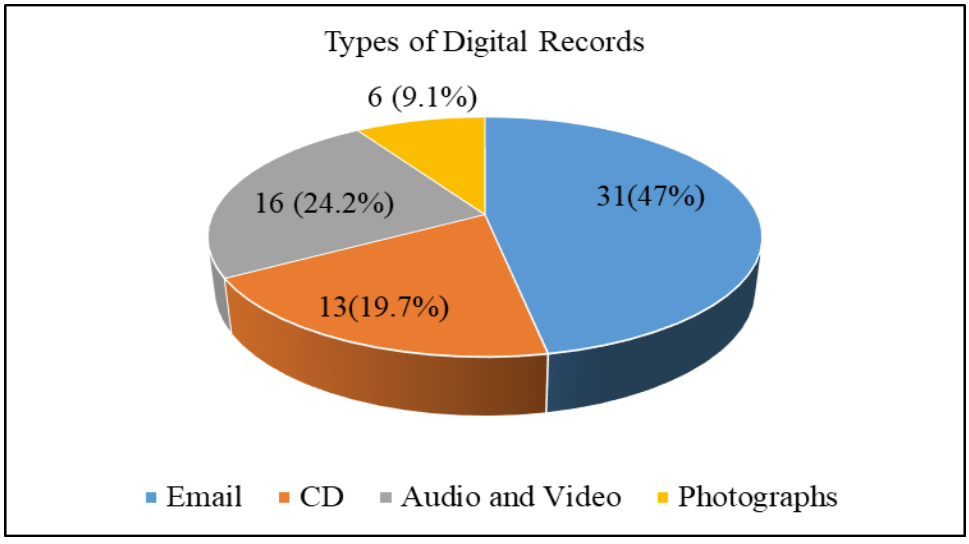


Figure 5. 1 Types of Digital Records

Personal observations revealed that there were intranets, internets as digital records which are accessible by the use of a computer. Digital records were not taken as records that needed to be managed as paper records.

During interviews respondents were asked how they manage information created and received through their email. The responses are presented below.

RM 7 said that '*all official emails are always printed and submitted to records management unit for filing as requested by the records management supervisors'*

HOD RM 2, HOD RM 5, SM 4, MHRM& Admin 3 reported that *'since there are no guidelines in place on the management of official email, each an individual officer devised their personal ways of managing official emails'.*

HOD RM 3 and ICT 4 all said that *'if the email is official after reading it, all officers archive it in their computers so that whenever they need it they can retrieve it easily'*

MHRM& Admin 1, 2 and HOD RM 4 affirmed that *'majority of officers do not know and we believe that majority of official email are deleted after being read'*.

HOD A 1 said that '*management of official email is problematic in departments because there is no communication from customers which comes through emails, they prefer to come to the reference section and use records physically'.*

The researcher realised that the officers did not know whether email communication forms part of the digital records. From observations it is clear that there were various types of records created such as word processed documents, savingrams and letters, spreadsheets, presentations, desktop published projects, oracle human resource system, government accounting and budgeting system, records management systems such as Land Administration Procedures Capacity and Systems (LAPCAS), Knowledge Repository Information System, National Archives and Records Management system.

5.5 File formats

A file format has been described as representation of information model by a variety of digital preservation sources, with the implication that a file format is a method of structuring information in a sensible way for storage, retrieval and use. Pennock (2019), Wheatley (2019) and May (2014:142) describe a file format as a representation of an information model with the implication that a file format is a method of organizing information in a logical way for storage, retrievals and use. The PDF format has become the standard for exchanging electronic copies of page based documents (Pennock 2019). Specifications have been created for some file formats such as TIFF1 that describe a fairly

sensible information model as well as how it should be realised into a format instance. According to Gupta (2017) a file format is a way of encoding data for storage in a file. In similar vein (Ngoepe 2008) asserts that there is an ever increasing flood of records created by media such as computers, tape and digital video disk (DVD) recorders in various formats. According to Pennock (2019:2) PDF is a cross platform file format designed to represent page based documents.

Johnson (2004) states that portable document format is the format people use when they need an electronic 'hard copy' document, and many enterprise, publishing and records keeping applications need accurate, versatile and capable analogue for paper. As indicated by Abrams (2007) institutional repositories are expected to accept all submitted properties regardless of format. In addition, the provision of best practice guidelines on the selection of preservation friendly formats serves is critical in informing digital content creators about the consequences of their decisions. Today, adobe portable document format is the most widely used and trusted document definition format in the world. The main goal is to thoroughly investigate and assess the risk associated with PDF in terms of impersonating individual and successfully launching an assault.

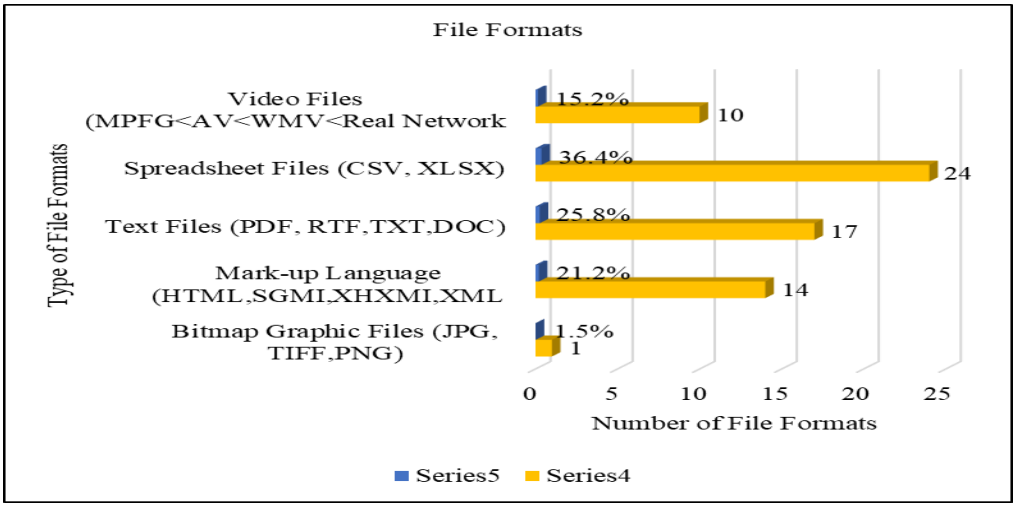


Figure 5. 2 File Formats

There are many file formats that exist in organisations and most digital content types are created. Respondents were asked to list the file formats that their ministries have on hand. Table 5.3 illustrates that 1 (1.5%) respondent reported that they use bitmap graphic files in their ministry, while 14 (21%) stated that they use mark-up language, 17 (26%) said text files, 24 (36%) indicated spreadsheet files, and 10 (15%) specified video files. Observations showed that in the government sector the commonly used file formats were the Microsoft office documents such as excel, word, access, videos, GIS and PDF. At the Botswana National Archives and Records Services they use EAD 7 for archival descriptions. According to an interview with ICT 2 and 3, they have geographical information data that analyses spatial location and organises layers of data into visualisations using maps.

5.6 Policy guidelines for managing digital records

As indicated by InterPARES (2012:8) a policy is a collection of rules or principles that govern decision making and behavior in order to achieve desired outcomes for a specific subject or objective in the digital realm. A preservation strategy is a basis for intervention and preparation to ensure the long term preservation and maintenance of an organisations documents.

Question 15 of the questionnaire asked if ministries have a written preservation policy that governs the handling of digital documents. Figure 5.3 shows that a total of 4 (6%) of respondents indicated that a preservation policy for the management of digital documents existed while 62 (94%) stated that no such policy existed. According to the study results, there are no written preservation policies in place in the Botswana public service.

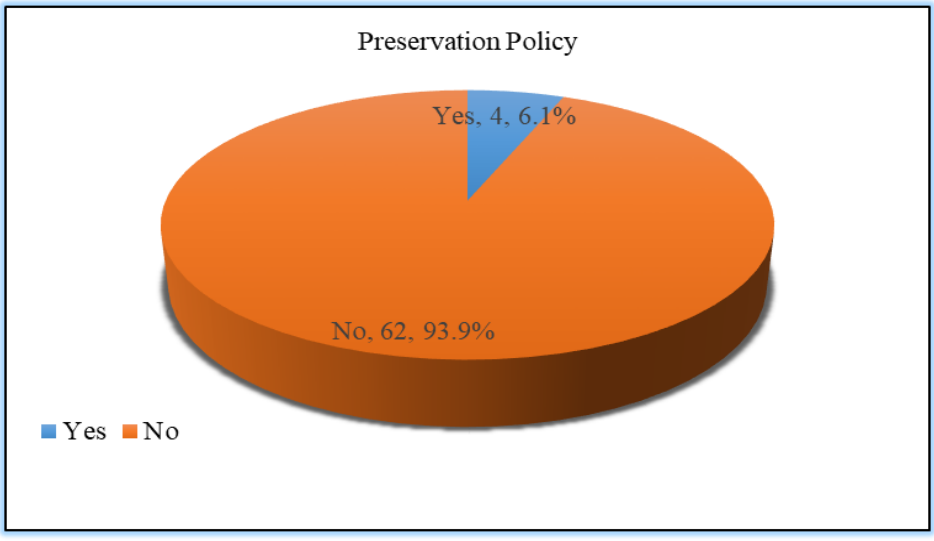


Figure 5. 3 Preservation Policy

The two respondents who were interviewed at Botswana National Archives and Records Services reported the following:

HOD A 1 said that 'there was *a preservation policy which is still in the draft stage so the task team is not yet nominated to review it'*.

HOD RM 1 lamented that '*I have never seen a preservation policy in the department'*.

Respondents SM 1, 4, HOD RM 3,4,6,7 HOD 1 A, MHRM and Admin 2 and 3 said that '*there was no preservation policy established in their ministries*

and preservation concerns were never addressed in their strategy because the idea of long- term digital preservation was unfamiliar to them'.

A personal observation showed that a preservation policy was developed though still at a draft stage. However, there were no comments nor suggestions made by the department. If a policy is still being developed or is at draft stage, it means there is no policy at all until it has been discussed and implemented. That is when an organisation can say that it has a policy.

HOD RM 2 said that '*the ministry has developed internal procedures of managing their digital records as they adopted the system that suited their own business processes rather than relying on Botswana National Archives and Records Services'.*

During personal observations a manual for the system was availed and that confirmed that there was neither a policy nor internal procedures. However, there is a system manual for daily usage. The observations revealed that the backup procedures were the only document found which outlined the guidelines on the management of data on the ministry's server.

ICT Manager 1, 2, 3 and 4 reported that ' *The department of Information Technology and Ministry of Transport the Information Technology and the Information technology managers there were several policies such as; System Acquisition, development and maintenance policy; Security Requirements of Information Systems; Cryptography Policy; Information backup policy; Information Communication Technology (ICT) Security Policy; Logging and Monitoring Policy; Records Retention and Disposal Policy; Segregation of duties policy and system acquisition, development and maintenance policy.*

The study's results found that there was little knowledge about use of policies resulting in lack of adherence as the majority of digital documents are still

stored in systems and never disposed of. The existing policies were not yet uploaded on the government data network website.

5.7 Standards for creation and preservation of trustworthy digital records

According to the International Standard on Archives (2003:2) the accuracy of digital records must be maintained by processes that retain effective records management controls and due to the complex nature of digital business systems, the capture of digital records and their ongoing management can be difficult. IRMT (2004:6) believes that the e-records management systems must conform to globally recognised standards and functional specifications and that they are necessary for ensuring that government ICT systems regularly establish, collect, organise, store, scan, retrieve and maintain digital records as well as protecting their integrity and trustworthiness. Furthermore, according to the International Records Management Trust (2004) adopting a national minimum standard is critical in order for government systems to be interoperable and share a similar baseline for the records functionality.

This study sought to find out standards adopted to manage digital records generated by the ministries. During the interview with heads of records management units, the following responses we gathered:

> *HOD RM 1 'our ministry has adopted the ISO 15489-1 2016 during the implementation of LAPCAS and it guides all the processes of the system'.*
>
> *'The ISO 15489-1 2016 is a standard that is used to direct record management in Botswana Public Sector,' said HOD RM 2.*
>
> *HOD RM 3 said that 'I do not know of any standard and I think it is the responsibility of the Botswana National Archives to see which standard can be adopted'.*

HOD RM 4 and 8 indicated that *'Standards for digital records should be known by the system designers'*.

HOD RM 6 said that *'the ISO 15489-1 2016 is the online but we are unable to use the standard because BOBS has not yet adopted it to be use by the Ministries'.*

ICT Manager 1 and 3 indicated that *'there were no guidelines for the management of digital data'.*

Personal observation made showed that there was no ISO 15489-1 2016 adopted in the Botswana Public Service. Personal observations showed that the few systems that were used were not accredited by BOCRA which has been mandated to regulate communications in Botswana.

5.8 Digital preservation strategies

To ensure the long term viability of digital content, several measures must be taken to protect it from technical obsolescence and to improve its retrieval and use in the future. A strategy, according to Nicklos (2010) is a general structure that offers instructions for actions to be taken while also being influenced by those actions. To put it another way, flexible and long term preservation strategies are needed to ensure that digital data remains available and reusable over time (Holdsworth 2007).

Table 5.5: Digital Preservation Strategies implemented by Ministries

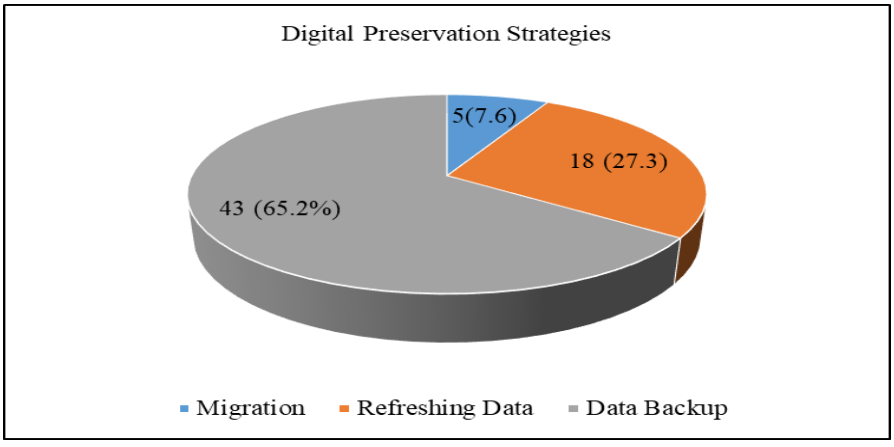


Figure 5. 4 Preservation Strategies

The respondents of the study state that there are digital preservation strategies used by ministries in mitigating the obsolescence of storage devices and file formats: 43 (65.2%) said that they use data backup, 18 (27.3%) said they used refreshing whereas 5 (7.6) use migration.

5.8.1 Migration to newer version preservation strategy

This method entails converting digital information into new formats until the old format becomes redundant. Migration preservation strategy, as indicated by Ngoepe and Van Der Walt (2009) is a time consuming and expensive practice that requires changing the configuration of the underlying data without changing their intellectual content.

A migration to newer version preservation strategy is required so that users download, view and use the data. Computer operating environments shift and evolve at a rapid pace, making migration both necessary and ongoing. According to IRMT (2009) there are many strategies that are widely used during knowledge conversion, such as converting one file format to another such as from a Microsoft word document to a PDF document. The purpose of migration is to preserve the integrity of digital objects and to retain the ability

of users to retrieve, display, and use them in the face of constantly changing technology.

Figure 5.4 highlights that 5 (8%) had a migration strategy of digital records which they normally do with the support of the officers in charge of information technology.

The four of the officers questioned reported as follows:

> SM 3 said '*I have used migration strategy during the time I was transferred from department to a ministry on promotion. All the files I used at departments I saved them using windows 97 which were saved by an IT officer from the computer I used into external driver and saved on the computer of windows 2010 I was issued at a ministry'*.
>
> HOD A 1 said '*Migration is one of the activities that I do almost every day in our department. I have been tasked with collecting oral history activities and the people whom I interviewed during this exercise are tape recorded and later on transcribed, typed and saved into a compact disk and memory cards to be used by researchers'*
>
> *'As an ICT manager, I have migrated or converted multiple officers files from a Microsoft word document to an open documents format and from one operating system to another such as Windows to Linux'* said ICT Manager 2. *I moved the ministry files from an old server which had a poor storage capacity to Department of Information offsite storage and I used different formats such as compact disks and memory cards so that if anything happens to the information kept in that server at least recovery can happen business can continue*'.
>
> HOD RM 4 and HOD A 1 said '*Currently we no longer migrate information as the conservator is no longer with our departments and the equipment is difficult to operate as the officers who are available*

are not trained at all. However, I am afraid that the department will lose vital historical information as the information currently is in paper format which has faded'.

HOD RM 7'I was responsible for keeping all the project information kept in the diskettes from the year 2008 to 2010 and as technology changes the old computers were changed and the information kept in the diskettes was thrown away because the new computers did not have provisions for their usage. I did not think that the information could be changed to a different formats'.

The findings showed that the majority of digital documents such as emails were printed on paper for reading purposes and discarded without being saved on electronic media. It was also found that the records management systems that were used had a provision to preserve digital records. However, the records management unit staff indicated that they had not started scanning paper records as their system was still new and they wanted to use it phase by phase. They used the systems to capture the metadata of current records only. Moreover, the researcher observed that out of the six ministries surveyed, five of them did not keep digital records in the department's records management units as they were not regarded as records. However, they were kept in the drawers of the action officers.

Through observations the study revealed that some officers kept floppy disks which they used some years back but the information saved could not be viewed as there were no computers with floppy disk drives. In addition, observations showed that all the information kept in those floppy disks were for mega projects that were still ongoing but were not accessible as they were not migrated to current media. These formats might have been corrupted and decayed as they have been neglected for a very long time rendering them un-useable.

5.8.2 Digitization

Observations showed that the ministries that were currently implementing the records management systems were scanning paper records or correspondences into a PDF document. The scanned correspondences were stored as PDF and as TIFF files in an intermediary folder saved on a desktop before keeping them in a server. One of the respondents at Botswana National Archives and Records Services confirmed the following:

> *HOD A as previously mentioned 'As a head of archives division there were records in paper format dating back as 1882 which were used before the country got independent which were deteriorating thus the ink were fading as the quality of the paper used was very poor. These records were digitized so that researchers continue to use them in a digital format.*

Observations made at Botswana National Archives showed that there were some newspapers that were digitised to prolong their lifespan.

5.8.3 Data backup preservation strategy

A data backup is a copy of computer data that is made and stored in a different location so that it can be used to recover the original in the event of a data loss. Data backups are critical to avoid data loss in the event of a catastrophe and to ensure business continuity. According to Kirchoff (2008) digital documents are copied and stored in various locations such as hard drives and tapes in order to create easily accessible data. The majority of organisations prefer to have two copies, the working copy and a backup up copy which is kept offsite.

From figure 5.4 above 65.2% (43) respondents reported that they use data backup as a preservation strategy. During interviews ICT Managers reported that they backup information on daily a basis as follows:

ICT Manager 2 and 3 stated that *'We do backup on official documentation on the internal server which is controlled by Department of Information Technology'.*

According to ICT Manager 5 *'Currently the infrastructure of our server is old and we are forced to backup information on it and by the year 2017 all the information that was kept on the server was affected by a virus and nothing could be recovered until today'*.

The respondents ICT Manager 1, 2, 3 and 4 all said that *'The backup strategy is done by information technology officers on the hard-drives and also on the servers and there are officers who are responsible for management of the server on a daily basis hence our trust that the information is secure. In addition, to that even though we are expected to keep information offsite with the department of Information Technology, it is not that they accept all the information to be kept on the offsite storage as they are currently having challenges of capacity for the government information storage'.*

SM 5 said 'as a senior manager, I always see our IT officers busy saving information to our offsite servers. However, there was a time I wanted to be given information from the offsite server and it was missing. So to me I don't trust us to rely on the servers rather to be initiative and come up with new ideas in this technological evolution'.

Observations showed that backup of government data is kept at DIT in Gaborone so there was no data center outside the city. In addition, there were no preservation strategy manuals.

5.8.4 Refreshing preservation strategy

This is one of the most important preservation techniques for preserving the dignity of digital artifacts while still allowing users to retrieve, view and use

them in the face of rapidly evolving technology (Note 2018). Furthermore, refreshing entails transferring a file from one physical storage medium to another on a regular basis to prevent the storage medium's obsolescence or deterioration. Physical storage degrade over time and technical advancements make older storage devices unavailable to new computers, ongoing refreshing is likely to be needed for many years. The researcher noticed that refreshing was one of the preservation techniques during the observations.

5.8.5 Collaboration engagement

According to Ashley and Dollar (2013) preserving and fostering cooperation among stakeholders is beneficial to an organisation with a mandate to preserve digital records. There are compelling reasons for greater cooperation within and between organisations as well as political pressure in some cases, in order to effectively confront and resolve the challenges of digital preservation (Digital Preservation Coalition 2019). However, this partnership necessitates closer collaboration and interaction between long collaborators such as information technology units and software- as- a- service providers. Furthermore the partnership should make use of financial, human, technological resources. It can expand beyond the company to other repositories and government agencies with a common and mutual mission.

Respondents were asked to identify institutions that they collaborate with regarding digital preservation of records. Table 5.5 illustrates that 53% (35) respondents stated that they collaborate with Botswana National Archives and Records Services, 24% (16) said Botswana Bureau of Standards, 18% (12) respondents stated Botswana National Library Services and 5% (3) indicated Botswana Broadcasting Services. The researcher discovered that there is no cooperation in the Botswana Public Service. In terms of general documents and information matters, the Botswana National Archives and Records Services collaborates with ministries and agencies. However, there is a lot of divergence when it comes to digital preservation.

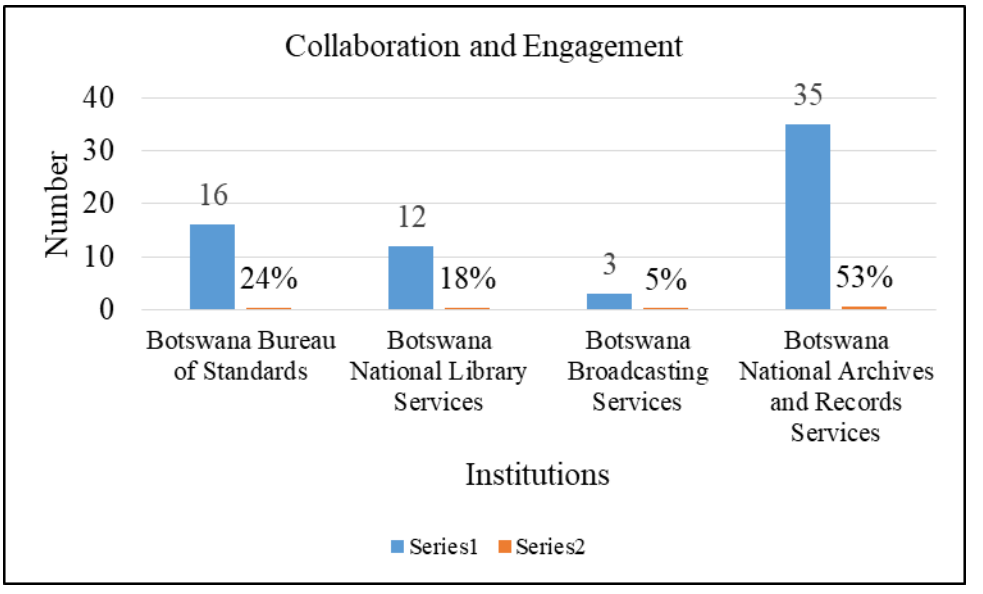


Figure 5. 5 Collaboration and Engagement

5.8.6 Technical expertise

According to Adu (2016) to empower digital preservationist, specialist with technological (systems), metadata (categorical) and collection skills are needed. To support all of the infrastructure and key processes required for a viable digital preservation capability, organisations must have adequate expertise in electronic records management and digital preservation. However technical expertise should exist within internal, contracted staff or by external service providers (Ashley & Dollar 2013).Technical experience on the other hand should be available from either internal contracted personnel or external service providers (Ashley & Dollar 2013).

Figure 5.6 indicates that 18 (72.7%) of respondents had technological experience on the systems they were currently using. A total 48 (72.7%) reported lack of technical skills that could be used in preparing activities for long term digital storage or deploying internationally accredited electronic records management applications.

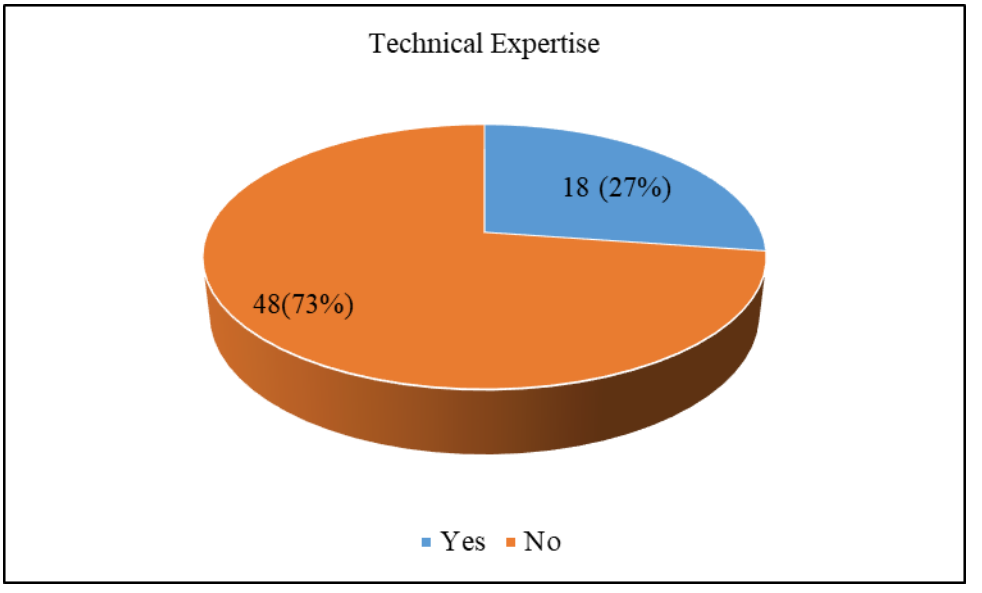


Figure 5. 6 Technical Expertise

In terms of technical expertise one respondent expressed concern that the training institutions do not provide adequate training on digital records management. The respondent stated that the majority of workers had training in records and archives management but had consistently shown low skill levels in management of electronic or digital records. Respondents were asked to describe their institution's digital preservation strategy, which they hope to implement over the next three years to increase staff expertise. Respondents to the survey expressed a desire for training in electronic records management.

5.9 The trustworthiness of existing digital records in terms of authenticity, accuracy, reliability, security and access for effective e-government delivery.

Lemieux (2017) states that a record is said to be trustworthy in archival science if it is judged to be true, reliable and authentic. Records must be created, maintained and preserved in order to be trustworthy. That is records should be dependable, accurate, authentic be available and functional over

time despite technological change. In essence, well managed, accurate and trustworthy records can be valuable and trusted sources of knowledge for memory and future decision making. The study's second objective was to assess the accuracy, reliability, security and access of existing digital records in Botswana government repositories in order to ensure successful e-government delivery.

The second objective of the study sought to examine the trustworthiness of existing digital records in the Botswana government repositories in terms of accuracy, authenticity and reliability for effective e-government delivery.

5.9.1 Authenticity and reliability of trusted digital repository

Xie (2016) stipulates that digital repositories are information systems that ingest, store, maintain, retain and make digital content available. The Research Library Group states that a digital repository is an institution responsible for the long term preservation of digital records as well as making them available to the societies that the depositor and the repository have agreed on. This may be the library, archive or museum that functions as legal deposit institution, with various partners performing various levels of archiving functions and responsibilities over varying time periods. Most of the record's trustworthiness in the modern age is now externally found and must be checked through its provenance (Duranti 2010).

According to Kelton, Fleischmannand and Wallace (2008) accuracy is described as 'the degree to which information is free of errors' so information systems should report accurate data. The ISO (2016) indicates that a reliable record is one whose contents can be relied upon in the context of subsequent transactions or activities as a complete and accurate description of the transactions, activities or facts to which they testify. Since it is usually in the interest of records creators to create reliable records and the creation of comprehensive formal procedures to govern formal procedures, reliability

appears to promote (but not guarantee) consistency in bureaucratic environments (Duranti 2005). Furthermore, the word reliability can only be used if the term accuracy is used.

During the interview the researcher discovered that all the digital records produced in the Public service were stored on servers with no specified digital repositories. When they were asked about the reliability and trust provided by the digital repositories, three respondents lamented as follows:

> *ICT 1 and 3 'The digital records that are under the custody of the DIT are insecure hence no integrity at all'*
>
> *ICT 2 and 4 'The infrastructures of the servers are very poor and they are unable to keep digital records beyond their lifespan which lead to irretrievability and loss. For instance if we can be asked to retrieve an electronic version of the year 2010 digital records it will be very difficult or if found it will not be a complete information'*
>
> *HODRM 1, ICT 5 and SM 3 'Currently most of our customers are not happy with the services we provide to them, if you look at the land allocation issue in the country, it's frustrating as the government does not have enough information on plot allocated to citizens and that is a threat to the land allocators as that can lead to fraud as more people will fake and not give accurate information'.*

5.9.2 Appraisal of digital records

Appraisal is the method of reviewing business operations in order to decide which records must be captured and for how long they must be held in order to satisfy business needs. Respondents were asked whether they had moved digital records from existing semi-current or non - current storage. There are no protocols in places for the transfer of digital records during the assessment process (58%). 8 (12%) respondents stated that they have transferred digital

records from their ministries to Botswana National Archives for preservation purposes. Observation showed that at the Botswana National Archives Records Centre there were some videos that were kept in a cold room from some of the ministries. A closer look at those videos indicates that they were just transferred but the record centre and had no machines which they could use to play the videos to check the quality. A transfer manual was also checked to see the procedure for the transfer of digital records and it was found out that there were no guidelines referring to the digital records transfer.

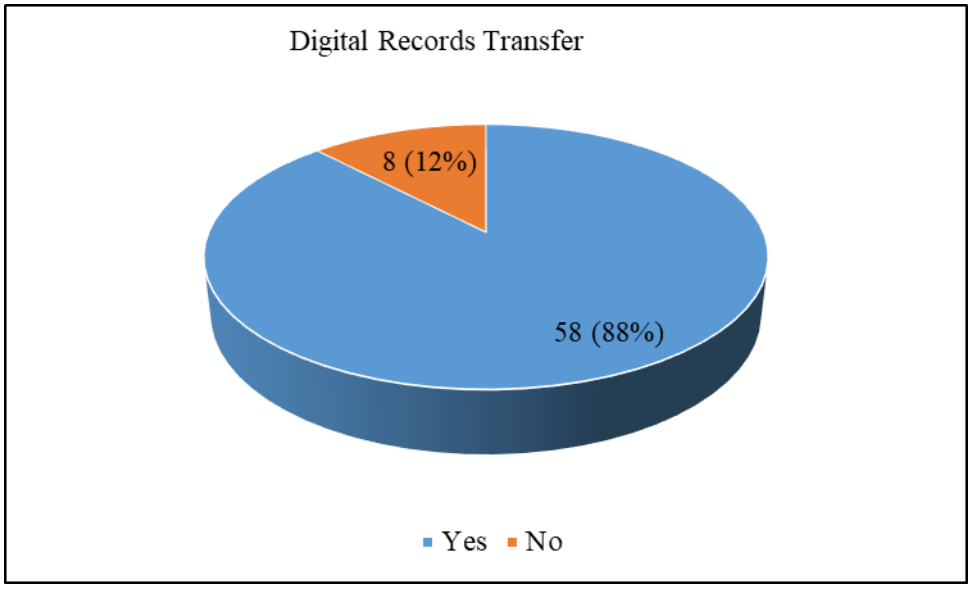


Figure 5. 7 Digital Records Transfer

Observation revealed that appraisal of digital records was not conducted but records were kept in their systems since the implementation of those systems and that affected the systems as sometimes they became very slow. In addition, one respondent suggested that they appraised their digital records but did not dispose of records such as diskettes, cassettes, CD'S and DVD'S during interviews at Botswana National Archives and Records Services.

5.9.3 Metadata and authenticity

The ISO 15489-1:2016 describes metadata as data describing context, content and structure of records and their management over time. Franks (2013:73) states that metadata ensures the authenticity, reliability, usability and integrity of the record and can be used as evidence of business transactions and activities. Metadata is a powerful tool to help organisations find records, understand them and use them to serve multiple purposes. There are several categories of metadata such as structural metadata (design of the data) provided to support the use of the objects, descriptive metadata which describes the creator or provenance of a record and administrative metadata which includes technical metadata, preservation metadata and rights management metadata (IRMT 2016:27 and IRMT 2008). (Mosweu & Ngoepe 2018) state that metadata is very important especially on the issue of long preservation of digital records. It plays a vital role in identifying key information necessary for conducting the conversion or migration processes such as hardware and software used to create the digital information object.

Figure 5.8 shows that 36 (55%) respondents indicated descriptive, 15 (23%) structural, 10 (15%) administrative and 5 (8%) were not sure about the type of metadata used in digital records creation. Observation revealed that an administrative metadata was commonly used which showed the file types or modules, the date and description of file creations and classified access rights. Metadata also enables the managed disposition of records by imposing rules about which records can be disposed, when they can be disposed and by whom. It is worth noting that systematic disposal of records will free up space thus maximising the performance of the technology (IRMT 2016:28). Through the interview session respondents were asked whether they use classification schemes and retention and disposal schedule to ensure authenticity. Their responses were shown below:

All the ICT 1, 2, 3, 4 and 5 *' Classification scheme and retention schedule are tools that are used on paper records only by RMU staff but other business system does not need records management tools and it is not allowed for records within the system to be destroyed'*

HOD RM 5 *'Classification scheme is a tool that needs to be approved by the Botswana National Archives and Records Services so it takes time for the approval to be granted, and we couldn't wait rather implement the system while awaiting for approval'.*

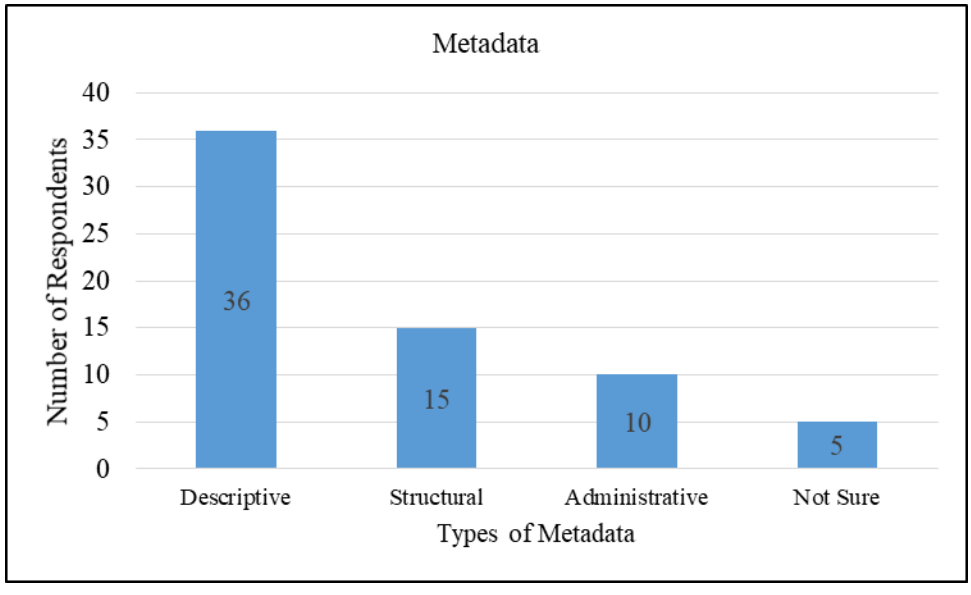


Figure 5. 8 Metadata

Observation revealed that a classification scheme was used as a retrieval tool to locate file reference that are classified under the subject, that were organised by organisational chart, or to see files open by everyone without any classification.

The study revealed that if a file is needed it was checked on a file plan by filtering either through a subject, arrangements within a cabinet or by public folder (see figure 5.9).

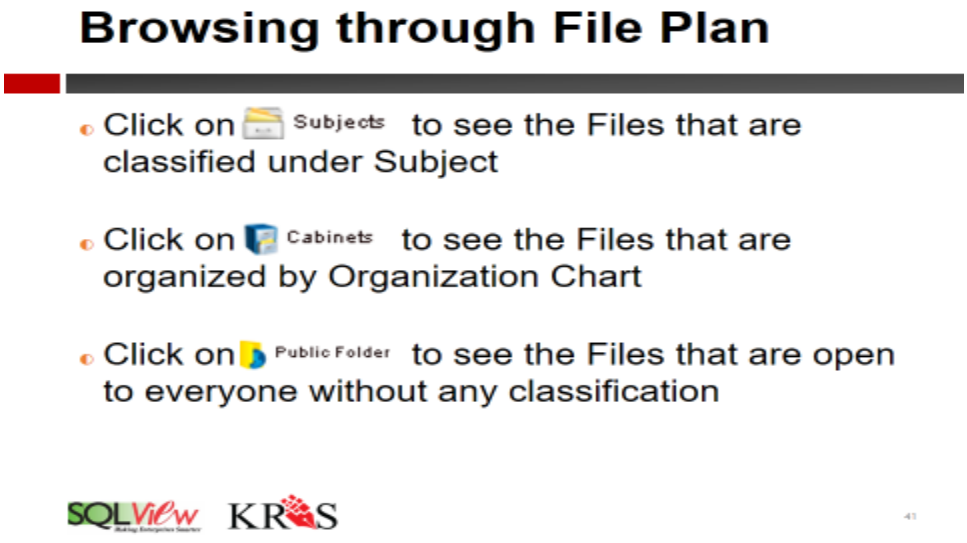


Figure 5. 9 File Plan

Personal observation showed that within the file plan there is display of a file reference and its contents. The contents of the file displayed the correspondences within a particular file but could not show the minutes captured.

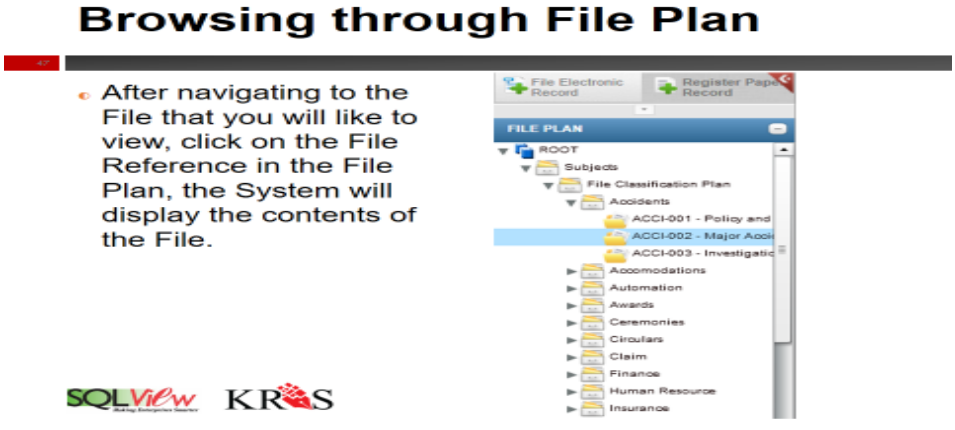


Figure 5. 10 Navigating a File Plan

In addition, the study revealed that the systems that were used did not have records management capabilities as they had no retention and disposal

schedule uploaded. In addition, these systems were procured and implemented without the involvement of the Botswana National Archives and Records Services.

ICA/IRMT (2016) stipulates that a metadata schema is a logical plan showing the relationships between metadata elements. It describes entities such as records, agents, functions their elements and their inter-relationships.

When asked on the type of metadata they use, 1 (2%) respondent stated that they are using MPGE-7- Moving Picture Experts Group for digital Audio and video, 15 (22%) reported that they use Encoded Archival Description (EAD), while 1 (2%) identified Dublin Core Metadata Elements (DCME) and 49 (74.2%) use Metadata Encoding and Transmission Standard(METS).

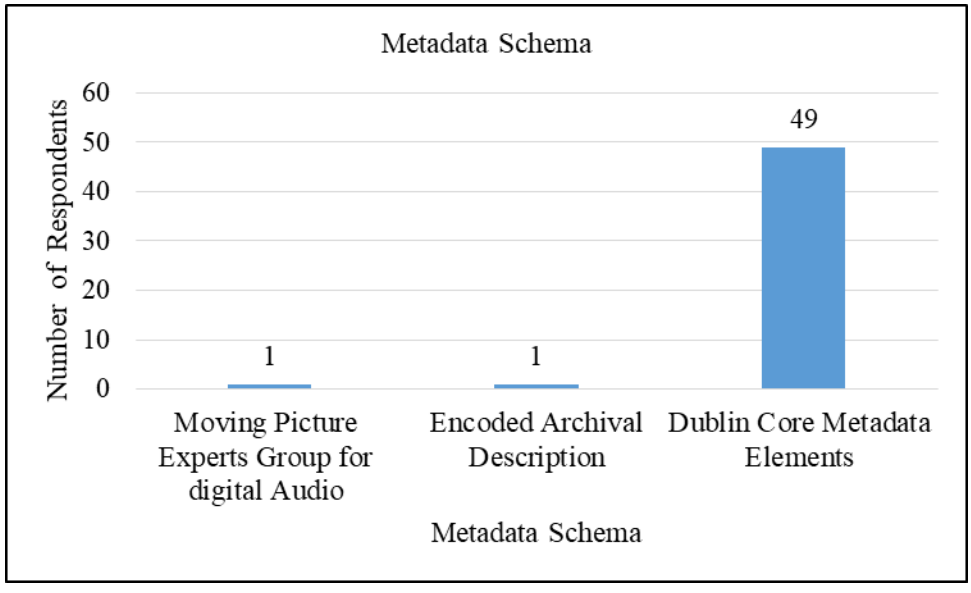


Figure 5. 11 Metadata Schema

5.9.4 Authenticity in digital records

MacNeil 2004) is of the view that records that are authentic are those whose identity and integrity metadata have been protected. National Archives of Australia (2006:12) states that to ensure integrity and to prove the authenticity of digital record within a collection over time, the essential characteristics of that record need to be captured and preserved. In this way, the context in which the digital record was created and used is captured along with the content.

Responses to whether they have ever thought of matters related to authenticity in digital records were presented in Figure 5.1. 46 (70%) said 'yes' to the question thus they have taken the issues of authenticity into consideration whereas 20 (30%) indicated 'no' meaning they have never thought of authenticity when using digital records.

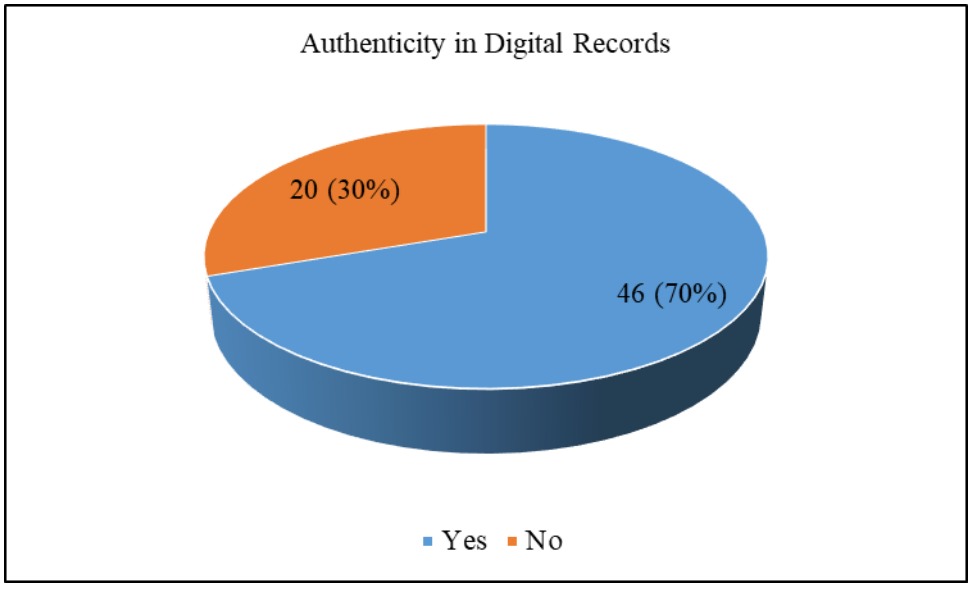


Figure 5. 12 Authenticity of Records

A follow up question was asked whether respondents have needed to show proof that the authenticity of digital records is important in their daily activities. Figure 5.11 illustrates that 16 (24%) said 'yes' that they were once asked to prove that authenticity is very important while 50 (76%) indicated 'no' meaning that they have never been asked to prove that authenticity of documents is important. During the interview respondents were asked to explain when they had been required to prove that authenticity of digital records is important. Three of the ICT officers opined that authenticity in the Public Sector systems is ensured through control mechanisms imposed on the systems or computers allocated to officers such as the use of usernames, passwords, access rights allocated to officers to perform different activities within the systems, the use of antiviruses to protect the computers against viruses and regular auditing of the systems functionalities and environment.

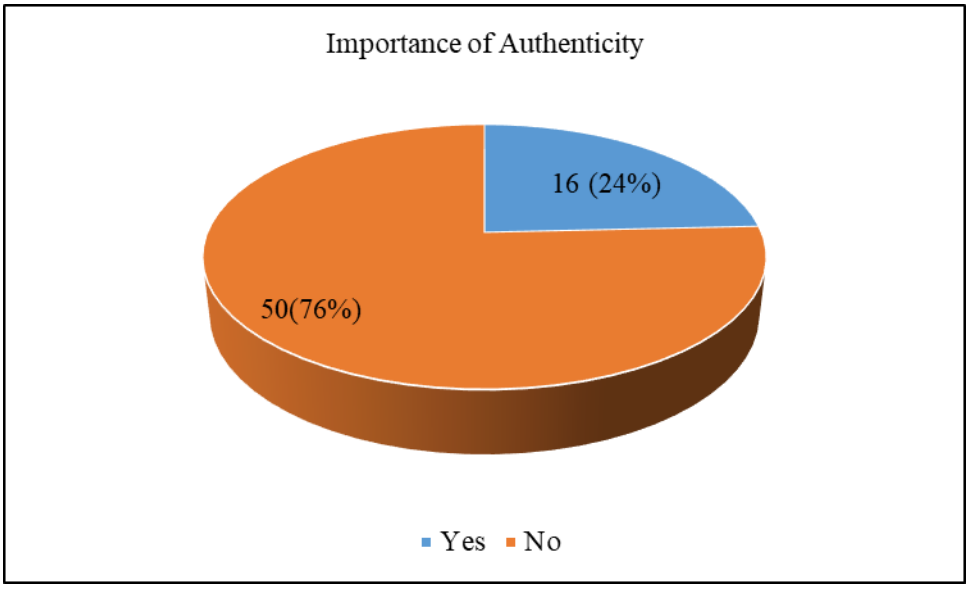


Figure 5. 13 Importance of Authenticity

A follow up question was asked asking them to specify how they judge a digital record as to whether it is authentic or not. Five respondents reported as follows:

> HOD RM 4 '*I am currently working as Principal Records Manager and to tell the truth judging the authenticity of digital records is difficult because the systems that the ministry use does not have an electronic signature and most of the time communications are done via emails'. It is difficult to say the emails used currently are authentic as it is easy for the recipient to add or delete some of the information unless the email is in a different format such ad PDF*.
>
> ICT 1 and 4 ' *They are unable to judge the authenticity of digital records because it is not easy to do that as there are no guidelines or rules which could be used to assist in the assessment'*
>
> HOD RM 6 indicated that *'I believe authenticity means true information and to me it is easy thus by referring to the organisation which created it and by understanding the content of that particular record.*
>
> HOD A 1 *'As an Archivist, I always use the following to judge the authenticity of digital records under my custody thus: name of the author and signature, archival date in which that particular digital record was created, the date in which the record was sent, received date indicated by the recipient official stamp, classification code where that particular record could be classified within the existing collection.*
>
> ICT 1,2 3 *' Authenticity of a digital record is judged through its integrity thus the officer who the action matter will be marked to, file*

numbers allocated to that particular digital record and actions that an officer made to a record after it has been completed'

Observation showed that the integrity of digital records is from where it came thus its origin. The majority of private records deposited at the Botswana National Archives such as photographs and videos kept for historical purposes used the identity of those depositing and the dates of their deposits to show authenticity. The originator was also indicated in the electronic mail so for emails that came from government institutions a letter head was used and that showed that the digital records were authentic and trusted.

5.10 A reliable operation of information systems for digital records

A trusted records management system includes the rules that control the creation, maintenance and use of the creator's records which support a presumption of the authenticity of the records within the system (InterPARES., 2005).The InterPARES (2008) states that record keeping systems are trusted information systems. A trusted computer system must provide authorized personnel with the ability to audit any action that can potentially allow access, modification, and effect the release of classified and sensitive information (A Guide to Understanding Audit in Trusted Systems 1998). To avoid easy manipulation, digital records must be managed in a record-keeping system as they produce authentic and reliable records (South Carolina 2007:2).

During the interview the officers were asked to show how they ensure authenticity in information systems. Respondents remarked as follows:

ICT 5 *'From my point of view I would say the long term preservation of the authenticity of records is uncertain'.*

ICT 2 and 4 *'Systems upgrading is done and during upgrading we are not always certain about the availability of a network so the records*

that will be preserved during that time may not be preserved and there may be no backup arching showing that those specific records exist'.

ICT 1 *'In our ministry the system allows us to decommission records and with that a record is trusted to be used for decision making'.*

ICT 3 'Assuring the integrity in such systems normally there are audit trails conducted and regular maintenance of the systems'.

Observations revealed that the systems that were currently in use create authentic records as they use lightweight directory access protocol from the Department of Information Technology. In other words all the systems used to create and store data required users to identify themselves to it before executing any action by the use of usernames and passwords. The systems protected authenticated data and it was not easy for those unauthorized to access the systems hence accountability is bestowed of the system. This allowed the verification of records identity and integrity by the system administrators. Access rights also exist thus each officer has a unique role within the system which prevents deletion or alterations. Data alteration logs are used whenever there is a need to take records out of the live system for preservation purposes.

Furthermore, it was observed that one of the ministries used a Knowledge Repository Information System which is an integrated all in one role based electronic record management solution. The system had records management applications for capturing, managing and preserving ministry important and critical records. The system was specially designed to put in place adequate technical and organizational measures for ensuring integrity and authenticity of critical records. It also served to monitor activities such as movement and disposal. Contrary to the requirements, it was found that despite its features the usage was still at its initial stage.

The researcher found that audit trails were conducted in which the ICT officer queried the systems to see the activities performed on a particular date, time and produce a report.

5.11 Security and access for authentic (fixity) digital records

Information systems face a number of security threats which may lead to data loss as some of the databases can no longer be retrieved. Laudon (2005) define security as policies, procedures and technical measures used to prevent unauthorised access, alterations, theft of physical damage to information. According to Folker et.al (2011:3), the security of electronic government is a core concern to citizens, governments and enterprises.

In order to maintain authenticity, records have to be protected from unauthorised access and alteration. It is also vital for processes and tools to be in place to enable the detection of unwanted changes. Respondents were asked whether their organisations digital repositories have security measures and access policies in place to secure the digital records. Figure 5.14 indicates that 62 (93.9%) of respondents said their ministries have security measures in place to prevent unauthorised access to digital records. Contrary to that there were 4 (6.1%) of respondents who indicated that their organisations did not have security measures.

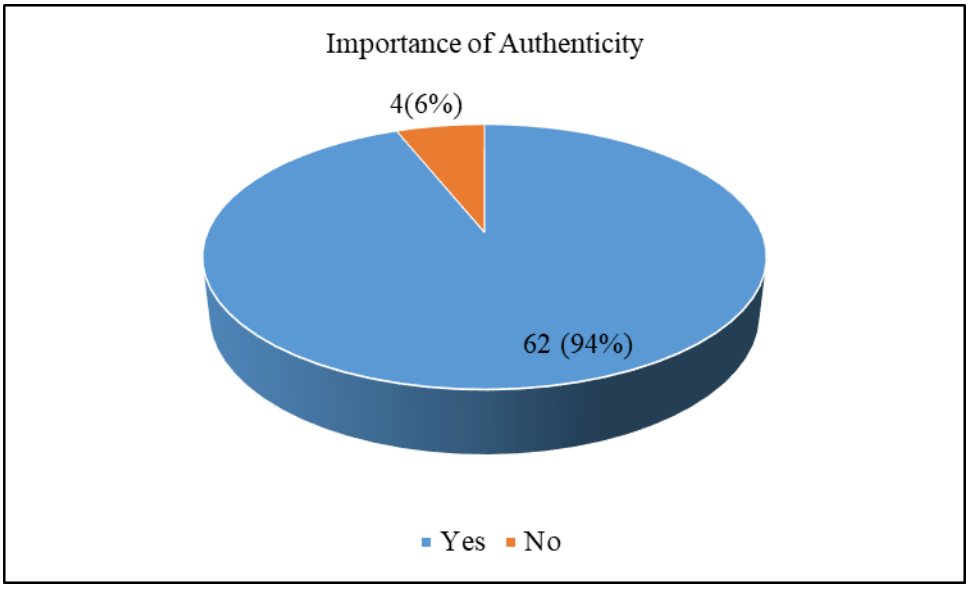


Figure 5. 14 Importance of Authenticity

According to Duranti (2014) risks to online records include unauthorised access, hackers and documents that can be stored anywhere and transferred at any time without the creator's awareness. Respondents were asked to describe how their ministries safeguard digital records against unauthorised access, tampering and viruses. Figure 5.14 highlights that 25 (37.9%) of the respondents use online password management or hygiene as a protection measure while 41 (62%) use desktop passwords to shield their digital records from being accessed.

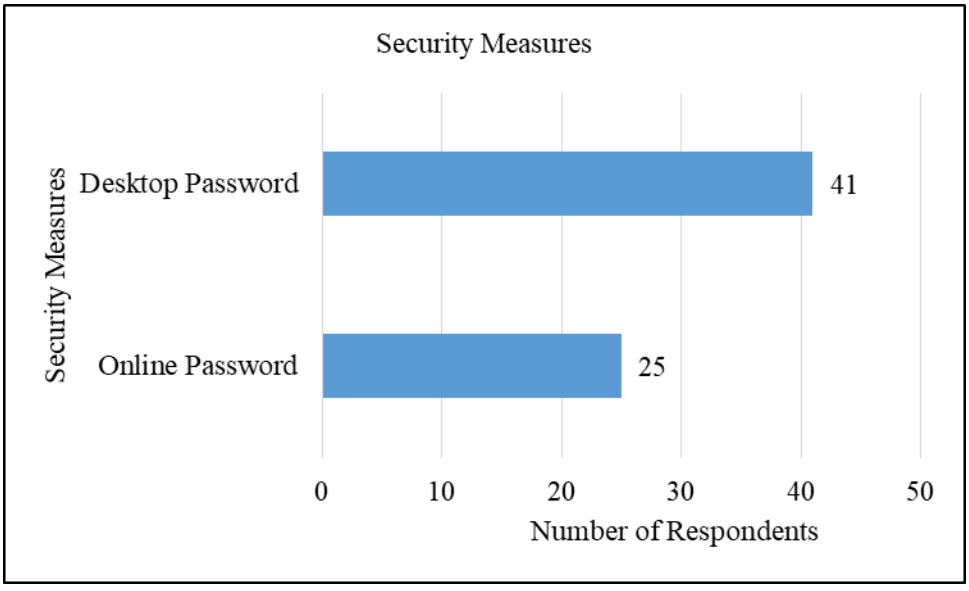


Figure 5. 15 Security Measures

The findings of the interview indicated that firewalls are used as a security measure. Three respondents indicated that:

> ICT 2 and 3 '*All the systems used to generate digital records have up to date properly maintained firewalls'*.
>
> *ICT 1, 3 and 5 'The system has been installed in the Local Area Network (LAN) hence a desktop application not a web based and all the users who had access rights are given desktop passwords'. They explained that the main purpose of desktop application was to protect government information and property from theft, corruption, manipulation and other types of damage and thus allows the information and property to remain accessible and productive*.

Observations showed that there were different approaches to computer system security management or hygiene such as the use of a firewall. A firewall had rules which filtered out unwanted intrusions and made it more difficult to access the system. In addition, there were access and permission levels which provides control on access to the records or documents and permissions to

read and delete records. Security classifications were assigned and records officers were issued individual passwords to prevent unauthorized access to the systems. These passwords were used to authenticate a user to access a system and officers were informed that the password needs to be kept secret thus not to be shared as it was only intended for the specific user. In all the systems used, each password was associated with a specific username as many officers were accessing the same system thus ensuring fixity of content by protecting the records from further alteration.

5.12 Storage of digital records

The way digital records are stored has shifted drastically. As opposed to other media types including paper and microfilm, the media on which digital records are stored is more fragile (IRMT 2011). In today's culture of online access, it is becoming more popular to use resilient IT storage systems for the growing volumes of digital records that need to be stored and perhaps more importantly that need to be easily and quickly retrievable (Digital Coalition 2019). Records storage that is appropriate and good ensures that records are accessible, accurate, and authentic that they are stored for as long as they are required (Kalusopa & Ngulube 2011). Different storage characteristics of digital media can have an effect on preservation strategies. Respondents were asked to describe the type of digital records storage they use. Figure 5.16 indicates that 42 (64%) of respondents use CD-ROM or DVD while 17 (26%) said they are kept as part of a digital preservation repository system and 17 (11%) said they outsource on a contract basis to a service provider. Observation showed that offline storage was commonly used for digital records in which records stored on removable media such as cassettes, videos, DVD and compact disks were manually retrieved. Some of the data was stored on the systems. In addition, digital records were kept on a server and were controlled by the information technology units.

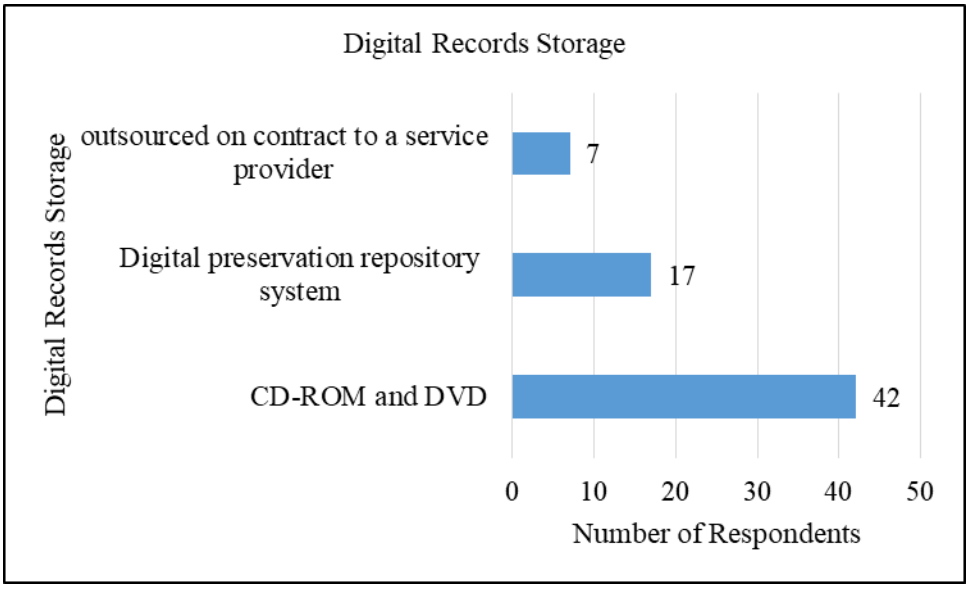


Figure 5. 16 Digital Records Storage

When asked to state where the storage is located, 10 (15%) respondents indicated that they store digital information in their premises whereas 56 (85%) stated that they are hosted by the department of Information Technology as depicted in figure 5.16. Observation confirmed that DIT coordinates the implementation of government computer based information system and it provides website hosting services for government, e-mail connectivity and internet access.

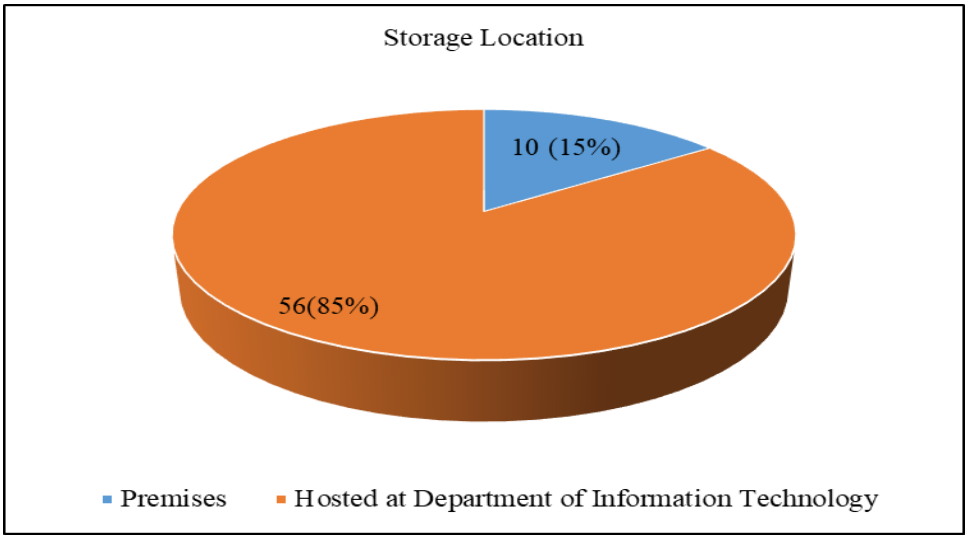


Figure 5. 17 Storage Location

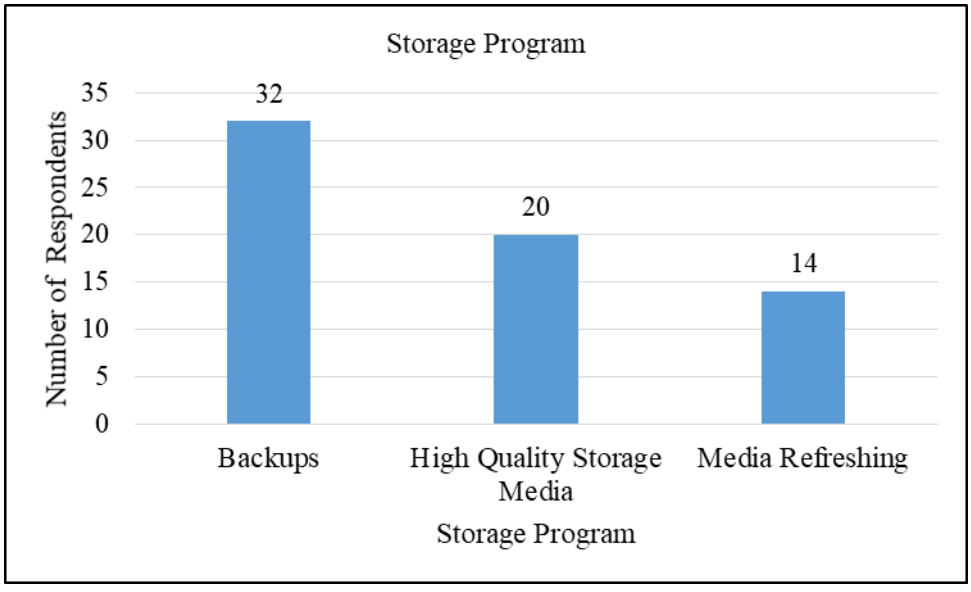


Figure 5. 18 Storage Program

Another question required the respondents to state what the storage program included. Table 5.18 indicates that 32 (49%) respondents reported that offsite storage for backups are included in the storage program, while 20 (30%) said that the storage program included the use of high quality storage media and 14 (21%) indicated that there was a media refreshing on the storage program.

5.13 Cloud storage

Sugimoto (2014) states that a cloud computing environment is a layered architecture consisting of infrastructure as a Service (IaaS) and software as a Service (SaaS). Cloud storage can be private with the infrastructure controlled and owned by the user and located on site,. It can also be public with the infrastructure managed and owned by cloud service provider and located offsite (Kamara & Lauter 2010).

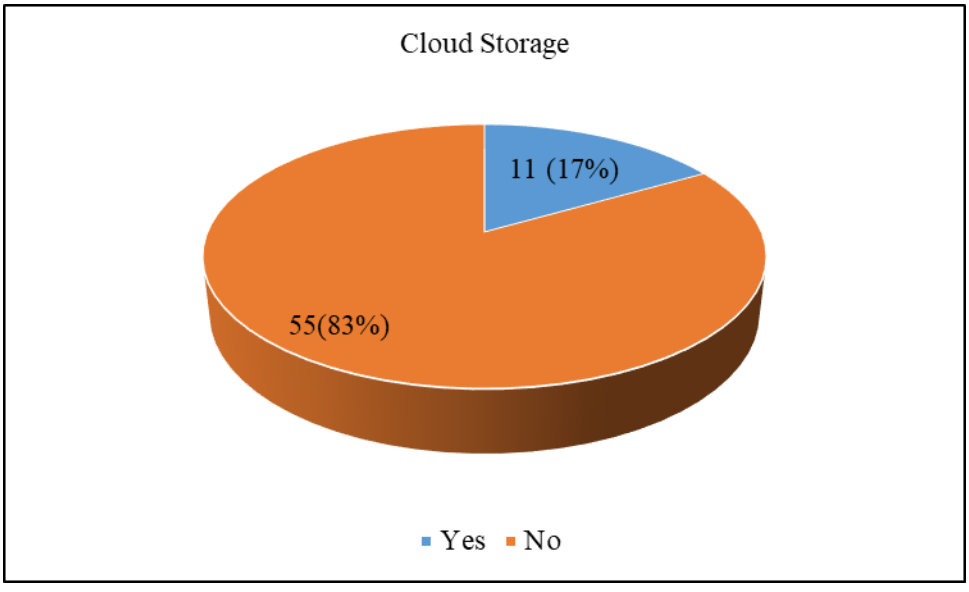


Figure 5. 19 Cloud Storage

When asked whether they see cloud storage as part of their storage architecture 11 (17%) responded by saying they store some of their information on cloud storage while 55 (83%) responded that their information is not stored on the cloud storage as shown in figure 5.19. Observation showed that the Botswana Public Service has not yet considered storing their information on cloud. This is a contrary to the respondents who indicated that they stored information on cloud.

5.14 The level of ministries in terms of digital preservation capability

During an interview, respondents were asked to express their thoughts on the ministries digital preservation capabilities. Three respondents reported as follows:

> '*I cannot say our Public sector was capable of preserving digital records but all of them have websites which are not updated regularly'.*
>
> *'The level of capability in digital preservation in the Botswana Public Sector is difficult to measure but few ministries have attempted and the problem might have been access restrictions'.*

> '*The level of digital preservation is minimal or very low in the Public Sector as the issue of preserving digital records is too silent or unknown by many officers'*.

Respondents were asked to state the percentage of digital collection or information available online. This question was not answered by respondents at all. Surprisingly, there were many audio visual records at Botswana National Archives and Records Services that were not available to users forcing researchers to travel to Gaborone for use. The Botswana Public Service has adopted and implemented systems as an e-government drive without taking preservation issues into consideration.

Observations showed that across the Botswana Public Service, data is held on digital form. It also emerged that there were no repositories which could be used to preserve digital information. In addition, all the websites for the ministries were surveyed and very little information about the ministries is available online. A sign that the web pages were not updated regularly. Table 5.2 shows the status or level of the ministries surveyed in terms of digital preservation capability. It reflects that a majority of the ministries are not capable of preserving digital records for posterity so there is a high likelihood of data loss as it will not be retrievable or deleted due to viruses or hardware and software obsolescence.

Table 5.2 Digital Preservation Status

Name of the Ministry	Policy	Strategy	Collaboration	Technical expertise	Standards	Digital Repository	Level
Ministry of Transport & Communication	X	✓	✓	X	x	x	Capacity for Nominal Digital Preservation (0 Score)
E-government Office	X	✓	✓	✓	x	x	Capacity for Nominal Digital Preservation (0 Score)
Ministry of Land Management Water & Sanitation Services	X	✓	✓	X	x	x	Capacity for Nominal Digital Preservation (0 Score)
Ministry of Finance & Economic Development	X	✓	✓	X	x	x	Capacity for Nominal Digital Preservation (0 Score)
Ministry of Employment, Labour Productivity & Skills Development	X	✓	✓	X	x	x	Capacity for Nominal Digital Preservation (0 Score)
Ministry of Investment Trade and Industry	X	✓	✓	X	x	x	Capacity for Nominal Digital Preservation (0 Score)

Ministry of Youth Sport and Culture-Botswana National Archives and Records Services	Draft Policy	✓	✓	X	x	x	Capacity for Nominal Digital Preservation (0 Score)

Table 5. 2 Score Card for Ministries

Capability Features	Digital Preservation Policy	Digital Strategy	Collaboration Engagement	Technical Expertise	Formats /Standards	Security	Access	Metadata	Trusted Digital Repository
MYSC	X	Back up of data by DIT	Yes	X	X	Yes	Yes	Yes	X
MFDP	X	Back up of Data by DIT	Yes	X	X	Yes	Yes	Yes	X
MITI	X	Back up of data by DIT	Yes	X	X	Yes	Yes	Yes	X
MLWS	X	Yes	Yes	X	X	Yes	Yes	Yes	X
MTC	X	Yes	Yes	X	X	Yes	Yes	Yes	X

Table 5.3 is a scorecard showing that in the Botswana Public Service there is lack of uniformity in digital preservation readiness hence less contribution on the e-government strategy; this affects service delivery. The strategic

framework will be used to improve the weaknesses shown on the above table.

5.15 Challenges encountered in digital preservation

Respondents were asked to state challenges encountered on digital preservation, Respondents SM 1, SM 2, SM 3, ICT 1, ICT 3 for IT Managers, HOD RM 1, HOD RM 3 and HOD A all observed that digital preservation policy was reported as the major factor that hinders access to digital records.

The results of the study revealed that the Botswana Public Service lacked integrated national records management systems. Furthermore, the study's findings showed that there was shortage of trusted digital repositories for Botswana Public Service digital records, as some of the servers storing digital records had inadequate infrastructure.

Lack of training continues to trump efforts to protect digital records.

RM 3, 5, 6 and 7 '*There are no standards to use on the management of digital records and maybe that is the reason for their negligence by most professionals'.*

Some of the problems that they face, according to ICT, RM 4, RM 6, RM 7 and HOD A, are storage issues and access to digital records. CT 2 indicated that '*Botswana power cuts was a problem that affects networks. Load shedding is said to be affecting IT infrastructures in a negative way and sometimes damages facilities'.*

HOD A specifically said that '*There was lack of budget or unlimited funds allocated to Records and Information units which cripples preservation strategies and practices to be used or adopted'.*

The study findings revealed lack of IT resources, especially sophisticated scanners, which management considers to be prohibitively expensive. However, some equipment takes a long time to obtain.

RM 4 and HOD A stated that '*improper system functionalities, as there is high possibility of some digital records not been found whenever needed for business decisions*'.

5.16 Chapter summary

The study findings were summarised in this chapter. Questionnaires, personal observations, documentary analyses and interviews were all included in the research. The chapter showed that the Botswana Public Service is actively driving the e-government strategy but the issues of digital records preservation are not taken as a strategic resource. Few ministries have implemented records management systems and some have stated that they are still waiting for the Botswana National Archives and Records Services to release the national system. The idea of digital preservation was unfamiliar due to lack of adopted standards. The study revealed that digital preservation strategies and repository (servers) were used to store digital records but the said servers lacked the capacity to store digital information. The Public service was not engaged in cloud storage to manage digital records. PDF was commonly used as a file format. The fire walls with access permission or rights on the system were used to access digital records within the system. The analysis of these results is presented in chapter six.

CHAPTER 6

INTERPRETATION AND DISCUSSION OF THE FINDINGS

6.1 Introduction

This chapter presents the interpretation and the discussion of the findings. The results are interpreted and discussed in accordance with the research objectives that motivated the analysis. According to Cresswell (2014) interpretation is the stage at which the researcher takes a step back and forms a broader sense about a phenomenon based on personal observations, similarities to previous studies or both. Any thesis relies heavily on data collection and presentation of findings. Data interpretation and discussion are critical components of any research project as they assist in understanding data distribution, identifying errors, missing values and outliners. In the end that data should be more understandable and meaningful (Dilip 2016: 50). The data interpretation is presented according to the following objectives:

1. To assess the digital preservation infrastructure in terms of the policy, strategy, collaboration and technical expertise in the government ministries within the context of e-government.

2. To examine the trustworthiness of existing digital records in the Botswana government repositories in terms of accuracy, authenticity, reliability, security and access for effective e-government delivery.

3. To determine and compare the stage of each ministry in terms of digital preservation capability.

4. To identify digital preservation challenges faced by ministries that could impact on implementation of e-government.

6.2 Digital preservation infrastructure in the government Ministries within the context of e-government.

Spacey (2017) defines digital preservation infrastructures as foundational services that are necessary to the information technology capabilities of a nation, region city or organization. These services are internet backbone, fixed broadband, mobile telecommunications, communications satellites, network infrastructures, data centers, cloud computing, platforms, systems, applications, user devices, API's and integration and IOT.

Dollar and Ashley (2013:4) indicated that a digital preservation infrastructure feature has seven components. A digital preservation infrastructure is essential for ensuring sustained organizational commitment. The seven components are the digital preservation policy, digital preservation strategy, governance, collaboration, technical expertise, formats and designated community. The first objective of the study was to assess the digital preservation infrastructure in the government ministries in terms of the user devices, systems, file formats, policy, strategy, collaboration and technical expertise. The findings are presented further below.

6.2.1 Types of systems for managing digital records

A digital system is a combination of devices designed to manipulate logical information or physical quantities that are represented in digital form (Tocci, 2010). There are several types of systems used for managing digital records. These are File management systems, document imaging system, electronic document management systems, electronic records management systems, electronic document and records management systems, enterprise content management systems, and digital repositories.

The study sought to find out the types of systems used to create records in the Botswana Public Service. The results of the study showed that the entire Public Service uses business systems and a few ministries put in a lot of effort

to incorporate records management systems like NARMS, LAPCAS and KRIS. This shows that the Botswana Public Service is still at infancy stage in adopting records management systems to manage digital records. The lack of systems in place will result in loss of digital records leading to information gap in the Botswana Public Service. The few ministries that adopted the electronic records management systems show that the implementation was carried out independent of the Botswana National Archives to provide guidance and support such as skilled personnel and the actual implementation. Personal observation made regarding the business systems showed that government ministries did not have records management storage capabilities such as trusted built in digital repositories and digital signatures for creation of electronic records. This is a serious issue because the digital records reliability and accuracy are in doubt as they can vanish due to technical obsolescence or loss.

These results indicate that even though the Botswana Public Service has developed and implemented its e-government strategy very little has been done in the area of e-records management and records preservation. The records systems that have been adopted by other ministries were at infancy stage of managing digital records as all of them did not archive any records within the systems. Most of the ministries surveyed did not have an electronic records management system in place instead government information systems were mostly manual and paper based. This makes accessing digital documents such as email impossible and digital records are getting lost almost every day in Botswana Public Service.

6.2.2 Creation and capturing of digital records

The findings revealed that the Botswana Public Service relies on digital records for its operations, so records were generated and obtained from other organisations. These records are not well managed and Botswana Public Service is likely to end up paying heavily for the negligence of safeguarding

digital records. For instance, the e-mails were commonly used but not managed in a planned and effective way. The respondents had difficulty in managing emails as official records as they reported that they did not know which emails needed to be kept. This shows that there were no email guidelines provided to officers to use and manage emails. Failure to manage official emails is prevalent in government ministries as volumes of e-mail likely to be having vital information remains in personal inboxes and poorly managed in back - up systems.

All the three Ministries who use electronic records management systems, scan all incoming mail, capture the metadata into those systems and share the correspondence with the appropriate action officers. It was easy for the records management staff to track the response and delay of correspondences. According to NASCIO (2007:2) public sector electronic records are being generated at an unprecedented pace and policies and resources needed to handle them are severely lacking. The best way to ensure that email is safe, easily available and retrieved over time as alluded by (PABRICA no date) is to collect it into a records management system. If an organisation does not have an electronic records management system, copying emails and filing them in a paper system or shared network drives are all viable alternatives.

6.2.3 File Formats and their long term preservation

With regard to file formats, the findings revealed the use of bitmap graphic files, mark-up language, text files, spreadsheet files, and video files. Observations showed that emails which were used as a form of communication formats were created in a text document while their attachments were in PDF/A.

The findings confirmed that the Botswana Public Service creates large quantities of digital content, the majority of which is of permanent value but is a risk due to fragile media, technical obsolescence or other hazards. These

findings suggest that the Botswana Public Service bears a significant responsibility for maintaining and providing public access to long term government records. The sector also has the responsibility in managing and preserving digital information. There is a lot of negligence in management of these file formats which could result in their deterioration and failure to be retrieved for future use.. Pitman and Shipman (2008) outline features of archival formats that are said to be the best. The duo state that the file formats should be open, free of patent and license, self-contained, capable of embedding metadata, visually true to the original, they should support interactive elements, be machine and human readable, have a long lifespan and widely used, should be platform independent and use the Unicode or USS character set. In the Botswana Public Service there are different file formats used which need to be taken care of so that they remain accessible in future

6.2.4 Policy guidelines and standards for management of digital records

The aim of the study was to see if there were any policies or guidelines in place for the management of digital records. The study results revealed that Botswana government ministries lack written preservation policies. Observations revealed that the preservation policy which was still in a draft form at Botswana National Archives and Records Services. The policy has been at the developmental stage for a long time and the department had made no comments or suggestions. Even though some respondents felt this was a regulation the manuals were used as a guide in the Ministry of Trade's electronic records management system. The lack of a clear policy relating to the preservation of digital records could promote the presumption that the preservation of digital records is not a priority in the Botswana Public Service. Records management policies and practices, as Cook (1993) states are crucial in a number of ways:

- They enable organisations to allocate resources on the basis of principles and directions laid down by the policy.

- They assist in establishing control over records management activities in particular by putting regulatory policies that are required for coordination, sharing of records, standardization, creation and maintenance of all types of records.
- They provide an environment conducive to proper records management. Respondents were asked whether their ministry or departments have a written preservation policy that guides on management of digital records.

The documentary analysis revealed that the National Archives and Records Services Act of 2007 is insufficient and ineffective as it does not have a provision for digital archiving and digital preservation. In other words, there is no clear mandate on the existence of an electronic records policy for the management of digital records and therefore no digital records can be confidently classified and verified as authentic. The findings is supported by Mosweu 2018; Motupu 2015; Lowry 2013; Gbaje & Mohammed 2013; Ngoepe and Keakopa, 2011; Kalusopa 2011; Moloi & Mutula 2007; Kalusopa and Zulu 2009; Nengomasha 2009; Keokapa (2010), Luyombya (2010); Ngulube & Tafor 2006. Furthermore, these results support Pennock (2008) statement that issues related to establishing a long term digital preservation strategy are largely unexplored. The results support many global studies that found insufficient legislation, regulation and guidance for electronic records management (National Archives of South Africa 2006; Mokhtar & Yusof 2009; Ndayisiba 2011 & Nkwe 2012).

In addition, these findings also confirm the assertion of Pennock (2008) that issues regarding developing a sustainable digital preservation policy is unexplored to a large extent. The findings concur with several studies conducted globally which found that legislation, policy and guidelines for

electronic records management were inadequate (National Archives of South Africa, 2006; Mokhtar & Yusof, 2009; Ndayisaba, 2011& Nkwe (2012).

6.2.5 Standards for preservation of trustworthy digital records

The study's results showed that digital record migration strategies were widely used and that the responsibility for data migration is largely on the ICT officers. ICT officers transferred employees' data from old systems to new, modern computers. This standard was equally inadequate in digital preservation for as long as records are needed for decision making. In addition, the use and development of reliable standards has long been a cornerstone of the information industry as they facilitate the access, discovery and sharing of digital resources as well as their long-term preservation (Digital Preservation Coalition, 2019).

6.3 Digital preservation strategies

With regard to digital preservation strategies, the results showed that there are few attempts being made such as migration, data backup, refreshing and ministerial disaster planning.

6.3.1 Migration preservation strategy

The findings of the study revealed that the migration strategy of digital records was commonly used and the responsibility to migrate data was on the ICT officers. The ICT officers migrated data from the old systems to the new updated systems or officers' information to other new computers. In interviews, ICT officers reported that they migrated information from one file format to another. At the Botswana National Archives, migration was the responsibility of a conservator who migrated paper records to different formats as a way of prolonging their life span. According to the results of the study, migration activities differ by ministry and some do not seem to be incorporated into digital preservation programs or processes. Furthermore, this migration plan seems to have been implemented in combination with a broader device update. This is a sign of an ad hoc situation.

6.3.2 Data backup preservation strategy

The findings showed that data backup was used as a preservation strategy. This was also confirmed by ICT officers as they reported that they backup information on a daily basis. Personal observation revealed that at DIT data was transferred to offline storage after 10 years. The Department of Information Technology in Gaborone houses the Botswana Public Service records and there is no data center on the outskirts of Gaborone. This shows that government does not take protection of data as a priority as there were no plans showing an outskirt infrastructure of a data center outside Gaborone. This strategy does not guarantee long term digital preservation due to poor infrastructure of some servers and missing information kept in the servers. The Botswana Public Service data is not fully preserved for future continuity as it was not also included in the e-government strategy. This will result in irretrievability of digital records as the issue is not fully supported by senior management. These results are in line with those of Corrado & Moulaison (2014) who state that the backup strategy is ideal for short to medium- term digital record preservation. This means that if the Botswana Public Service manages to back up data on weekly basis, they will be able to recognise and restore corrupted or incomplete digital records within a reasonable time.

6.3.3 Disaster plan preservation strategy

The study findings revealed that the Department of Information Technology had a disaster planning initiative for all ministries. This was one of the essential preservation programme implemented to protect government digital records stored in all the systems that they were coordinating for the government. This was done to protect all of the information created and maintained in all of the public service systems currently in operation. Personal observation showed that for the public service, the basic web hosting services were available in Gaborone. There was no government cloud infrastructure in the country. This indicates that the Botswana Public Service does not have a

plan to build an offsite or remotely integrated data centre in the near future. As a result all the digital records kept in the systems are at risk of being deleted by any disastrous incident in Gaborone.

6.3.4 Collaboration engagements

According to Pardo (2005:10) information technology has become so prevalent and important throughout our society and it is critical to find ways to efficiently control its costs and effects through numerous organisations. Collaboration is key to making partnerships work. The advent of digital technology has necessitated collaboration among organisations in order to integrate the preservation and management of digital and other materials. According to the results of the study the Botswana National Archives and Records Services, the Botswana Bureau of Standards, the Botswana National Library Services and the Botswana Broadcasting Services collaborated. These findings show that the collaboration was only amongst the memory institutions but other ministries were not included. The researcher observed that there was little or salient collaboration on general records and information issues but there was a significant overlap on issues of digital preservation. International organisation and other departments such as the Museum which is also responsible for the preservation of artefacts were not included in the partnership. These results differ from those of (Mosweu 2019) and the UK National Archive (2016) which stated that memory institutions act as custodians of recorded memory and are integral part of community, cultural, official and unofficial history. As eloquently stated by Weatherburn (2019) cooperation will continue to be a key feature of the digital preservation culture, which will be done through well-established social networks, collaborations, information and expertise sharing.

6.3.5 Technical expertise

According to the results of the study, the majority of archivists and records managers lacked information technology needed to maintain digital records and retain proper methodologies. As a result, there was a lack of clarification on the models, necessitating the creation of a trusted digital repository audit tool for digital preservation. The ICT officers also lack skills on records management and this resulted in lack of collaboration between them and records personnel. This is evidenced by the fact that records managers and archivist do not participate in the management of digital preservation. The findings support the findings of studies by Keakopa (2018); Mnjama and Jain (2016:157); Ngoepe and Katuu (2017) and Mosweu (2018). ICA (2015); Ngoepe and Katuu (2015); Ngoepe & Keakopa (2011).Kemoni (2009:194).

6.4 The trustworthiness of existing digital records in the Botswana Public Service

6.4.1 Authenticity and reliability of trusted digital repositories

The study findings reveal that digital records produced in the Public Sector were stored on servers as no specified digital repositories were identified. Some respondents indicated that the infrastructure for the servers was poor and they were not certain about the reliability of the information kept in them. This means that if the servers get affected there will be a challenge in business continuity as some records will not be retrievable due to lack of trusted digital repositories. As indicated by NASCIO (2007:2), technological advancements present both opportunities and challenges. These opportunities are found in emerging technologies for managing digital assets while the dilemma is that as current technology becomes outdated older digital assets will become unavailable unless constructive measures are taken to keep them available.

6.4.2 Metadata and authenticity

Respondents were asked to describe the types of metadata they generate and how their ministries promote authenticity. The results showed that descriptive,

structural and administrative metadata existed and that the respondents were unsure of the form of metadata used in the development of digital records. Observation revealed that administrative metadata was commonly used and it showed the file types or modules, the date and description of file creations and classified access rights. Through the interview session, respondents stated that classification and retention as well as disposal schedule were not incorporated on the systems. These findings revealed that the Botswana Public Service continues to lag behind in terms of digital records creation, verification and interpretation tools. Since the classification scheme focuses on record material, the few resources listed are extremely important. This is required in order to finish the metadata extraction process from the classification scheme or file plan repository. ICA (2016) stipulates that metadata similarly to file numbers or document descriptions in the paper world, facilitates access and retrieval, supports confidentiality, privacy and preservation. It also provides the context needed to understand and use digital records.

6.4.3 A Reliable operating information preservation systems for digital records

The study findings revealed that some respondents considered microsoft outlook as an email system. The study findings revealed that systems are always audited but the main challenge is unavailability of network and this may affect activities such as backup of information. Observations revealed that the systems that were currently in use create authentic records as they use lightweight directory access protocol from the Department of Information Technology. In other words all the systems used to create and store data required users to identify themselves through usernames and passwords. The systems protected authenticated data and prohibiting unauthorised access to the systems and holding the users of the system accountable. The use of passwords and usernames allowed the verification of records identity and integrity by the system administrators. This concurs with the findings by

Mosweu and Ngoepe (2018) that usernames and passwords were one of the procedures used to declare records authenticity. Access rights are used thus each officer had a unique role within the system which prevented deletions or alterations. When it is necessary to remove documents from the live system for preservation data modifications are used.

In efforts to attain a rreliable operating information preservation systems for digital records, it the study observed that one of the ministries used a Knowledge Repository Information System. This is an integrated all in one role based electronic record management solution. The system included records management software for recording, maintaining, storing relevant and sensitive records for the ministry. The system was created with the aim of putting in place appropriate technological and organisational safeguards for ensuring the quality and authenticity of sensitive documents as well tracking their movement and disposal. As stipulated by ICA (2016:8) due to the fragility of digital media, the lack of reliable and full metadata and the rapid obsolescence of software and computer systems, creating and protecting digital records and retaining their integrity is difficult. Contrary to the requirements, it was found that despite its features the usage was still at its current stage or infancy stage. The ICA (2016:8) states that creating and protecting digital records and preserving their integrity is challenging due to the fragility of digital media, the absence of accurate and complete metadata and the rapid obsolescence of software and computer systems all of which place digital records at great risk. According to InterPARES (2008) record keeping systems are trustworthy information systems, so they must be implemented. Participation in the design and deployment of systems is a requirement and not a choice. Archival repositories must aim to develop records management systems to control both electronic paper records in order to retain records of ongoing importance in an electronic era, operating as they

do in an economic and political environment that stresses government transparency and performance (Laura, no date:129).

6.4.4 Appraisal of digital records

Observations and interviews found that appraisal of digital records was not conducted. It emerged that records were kept in their systems since the implementation of those systems and that affected the system as sometimes they became very slow. There were no documented guidelines which could be used to appraise digital records. These results reflect that the records personnel had no capability to identify digital records of enduring value. It also emerged that the systems that were used for digital records creation did not take records management requirements into the design of the system software as it was reported that they were not in use. The main problem of not conducting this exercise was due to lack of collaboration between the Botswana National Archives and the Department of Information Technology with specific reference to the need to incorporate retention and disposal schedules on the systems. These were vital for generating digital records that deprived the preservation of records and that might lead to losing control of the digital records in the servers. The lack of controlling disposal of digital records in the Botswana Public Service will result in preservation problems now and in future. This research concurs with many other studies in the ESARBICA area that have found similar results. These findings, for example are consistent with Nengomasha (2009) who found that managing digital records in Namibia was difficult due to lack of records preservation and disposal policies.

As stated by Preservica (2017) many government agencies and businesses are required to keep data for the duration of an individual's existence which may be 100 years or even indefinitely in the case of historical records. To maintain both the accessibility and the value of these records within these time frames, a different and more systematic approach is needed. According to Eastwood

(2004), the challenges of long term preservation of digital artefacts are becoming more complicated as a result of digital technologies, making it difficult to recognise materials of lasting value. In the Botswana Public Service appraisal of digital records was not done at all as there were no guidelines to assist officers in the identification of digital records that had enduring value and ephemeral value.

6.4.5 Security and access for authentic digital records.

Malware, data breaches, burglary and fire are just some of the security risks that must be addressed in the digital records management. The study's results reveal that security measures were in place to secure digital records from unauthorised access. The study revealed that there were online and desktop passwords given to users and firewalls installed in the systems to protect digital records from being accessed by those unauthorised. Observations made showed that access to the digital records held in the systems were mainly restricted to internal users. These results are consistent with those of Asogwa (2012) who claims that databases containing personal, financial and medical records that are useful to the business and individuals may be a security risk if adequate security safeguards are not in place.

An observation made showed that there were different approaches to computer system security management or hygiene such as the use of a firewall which had rules which filtered out unwanted intrusions and made accessing the system, data encryption, passwords and biometrics difficult. Officers were issued individual passwords to prevent unauthorized access to the systems. These passwords were used to authenticate a user's access to a device and officers were told that they needed to keep the password because it was only intended for a single user. Since many officers use the same system, each password was associated with a special username in all of the system used. In addition, despite the security measures in place the officers were operating without an access policy and that made the preservation of digital

sustainability questionable. Basu (2004) alludes that the security of information within the e-government system is a critical component in the citizen government confidence relationship. These results are also supported by Magama (2018). Finally audit trails were conducted to check any changes which might lead to reduction in permissions of the users. The system could be queried to check what happened within the system.

6.4.6 Storage of digital records

To be safe from environmental modification and corruption, access to digital records must be monitored in an adequate and secure storage environment (National Electronic Commerce Coordinating Council 2004:12).According to the results of this study, there are no centralised digital repositories where digital records can be stored. All the ministries used servers which were controlled by DIT in capacity. The Botswana Public Service has not yet considered storing their digital records on clouds. The study findings showed that storage of digital records is not considered as a strategic issue in the Botswana Public Service. The Botswana Public Service has an immense volume of digital records which are not well taken care of. This is risky as the records might end up disappearing leading to lack of cultural memory. This finding concurs with that of Adu & Ngulube (2015) who observe that that the storage of digital records cannot be sustained.

6.5 Chapter summary

The results of the analysis have been thoroughly interpreted in this chapter. The chapter established that the Botswana Public Service creates digital records but these are not managed sufficiently. The records are not given priority they deserve hence data might be lost and might never be retrieved in future. It was discovered that the vast majority of records are in paper format, with no plans to digitise them. This has taken lots of space which comes at a cost to the government.

The analysis also reflected that Botswana Public Service communicates via email, but there are no rules for managing official email records, so there is a high risk of official emails being deleted. The chapter showed that despite the e-government drive of digital preservation, preservation is lack of education on it. In addition, preservation is not taken as a strategic resource in Botswana Public Service as digital data is only kept in the in-house servers which are managed by the Department of Information Technology. The results of the study further revealed that there is no written policy in place for the management of digital records making them vulnerable to loss and destruction.

The Botswana Public Service does not have an offsite data centre where information can be saved in case of a disaster. The maturity level of digital preservation is very low as there are no preservation policies in place. As a result, retrievability of digital records will continue to be a challenge in the Botswana Public service over time. Furthermore, the protocols required to ensure the integrity and authenticity of digital records are not followed and this issue will take time to resolve.

According to the results of the study, there are no centralised digital repositories where digital records can be deposited. This research established that appraisal of digital records was never done. As a result this might lead to accumulation of records in the system resulting in the system not being effective and hence inefficiency in service delivery. The analysis has also revealed that data back-up of digital records was a commonly used sufficient strategy to ensure long-term accessibility and preservation. This approach however, does not address the issues that will inevitably arise when storing digital records in the Botswana Public Service's archives. The study also looked at digital record access and protection and found that there was a variety of different approaches to computer system security management or

hygiene. It was pointed out that these attempts do not make digital records to be secure as the servers are not compliant to any information standards.

The study revealed that the Botswana Public Service is still lagging behind due to a lack of publicly accessible resources for data creation, verification and interpretation. The study's results revealed that networks are still audited but the biggest problem is the network which can impact activities such as data backup. According to the results of the analysis, the majority of archivists and records managers lacked information technology skills needed to maintain digital records and preserve proper methodology use. Furthermore, the majority of records staff lacked technological skills to handle and direct the preservation of digital records, according to the study findings. In terms of cloud archiving, it is evident that the Botswana Public Service is not actively involved in preserving digital records on cloud due to lack of knowledge. In a nutshell, the Botswana Public Service is afflicted with preservation challenges due to unavailability of digital records policies for their maintenance.

CHAPTER SEVEN
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

This chapter presents the summary, conclusion and main recommendations of the study. The objectives of the study were to;

1. Assess the digital preservation infrastructure in terms of the policy, strategy, collaboration and technical expertise in the government Ministries within the context of e-government.

2. Examine the trustworthiness of existing digital records in the Botswana government repositories in terms of accuracy, authenticity, reliability, security and access for effective e-government delivery.

3. Determine and compare at which stage each Ministry is in terms of digital preservation capability.

4. Identify challenges faced by ministries in digital preservation that could impact on implementation of e-government.

5. Propose an appropriate framework for the assessment of the digital maturity capability in the Botswana public sector that can enhance e-government delivery.

7.2 Summary of findings

7.2.1 Types of systems for managing digital records

The study discovered that the three ministries had an electronic document management system implemented to support management of electronic records while others were still using the manual systems. The ministries which used electronic records management systems were the ministry of Trade and

Investment, the ministry of Land Management and Water Sanitation, the Botswana National Archives and Records Services. However, the systems were not integrated. The results of the study showed that e-government was not prioritized. What actually emerged was that the ministries seemed to have been waiting for the NARMS system piloting plan to be shared and the system to go live, rather than to provide a solution to boost service delivery. The systems capability of preserving digital records in government ministries was inadequate. The study also revealed that government ministries did not interoperate. Generally, the result indicated that digital information for the Botswana Public Service might get lost and may never be accessible in future

7.2.2 Creation and capturing of digital records

The Botswana Public Service creates a vast majority of digital records manually and electronically. These records are created with the use of electronic record management systems. Emails are commonly used for internal and external communication. Furthermore, capturing email through a records management system ensures that the records are safe and reliable; it helps the organization to decide how long email records should be kept and disposed of in accordance with internal records management policies and practices.

7.2.3 File formats and their long term preservation

The findings revealed that although different formats fo long term preservation were used, they were not effectively monitored. In addition, there are challenges to the preservation activities. The formats used do not guarantee that the records will continuously be used in future as they will be affected by obsolesce. According to the study findings digital preservation activities were not prioritised in the Botswana Public service.

7.2.4 Policy guidelines and standards for management of digital records

The study revealed that the Botswana Public Service lacks digital preservation policies and standards to govern the creation, storage, retrieval and preservation of digital records.

7.2.5 Collaboration and engagements

The study found that there was a collaboration which did not include preservation programmes but rather general issues on information management such as records file classification scheme development, records surveys or audit and appraisal exercises of paper records**.** The majority of the institutions which as indicated by respondents do collaborate are still faced with the challenges of digital preservation. This shows that ideas, initiatives, models and methods are not shared at all.

7.2.6 Technical expertise

The study found that information management experts, archivists and ICT officers lacked the requisite skills to deal with digital records preservation.

7.3 Trustworthiness of existing digital records in terms of accuracy, authenticity and reliability for effective e-government delivery

7.3.1 Authenticity and reliability of trusted digital repositories

The findings indicate that the Botswana Public Service does not have adequate mechanisms for determining authenticity of a record. Despite few strategies adopted, sustainability, accuracy and reliability cannot be guaranteed through time. According to the findings of the study, digital records created in the public service were stored on servers and no specified digital repositories were identified.

7.3.2 Metadata and authenticity of digital records

Metadata plays a critical role in ensuring the authenticity, accessibility and understandability of information over a long term. The introduction of records management systems in Botswana Public Service occurred without the

approval of functional file classification schemes, resulting in adhoc file identifications. The systems have not been turned on yet because they are all on standby. The systems have not yet been activated as they are still at the current stage of managing records.

7.3.3 A reliable operating information preservation system

In the Botswana Public Service, few ministries have implemented electronic records management systems. The implemented systems are susceptible to manipulation even though they are expected to provide reliable, authentic and understandable records.

7.3.4 Appraisal of digital records

The study findings showed that appraisal of digital records remains problematic to records personnel since the systems that produce and hold digital records have never been appraised. This was due to the systems' lack of an established and enforced retention and disposal schedule.

7.3.5 Security and access of authentic records

In the Botswana Public Service the servers are unable to keep digital records beyond their lifespan. This can result in loss of data that cannot be recovered. Further, to maintain authenticity, records have to be protected from unauthorised access and alteration.

7.4 Digital preservation strategies

In the Botswana Public Service, digital records are created daily but the government still relies on the old methods and tools for preserving digital records. The records staff is not dedicated to keeping electronic records open for as long as they are needed. Few strategies such as data backup, refreshing, migration and ministerial disaster plan are used by the ICT officers. Only three ministries that were implementing electronic records management systems were digitizing paper correspondences into the systems.

7.5 The stage or level of ministry in terms of digital preservation capability

The Botswana Public Service is still at an infancy stage of digital preservation. First and foremost the evidence act of 2014 and the communication transactions acts, 2014 permits the use of digital records to provide evidence in the courts. Despite these laws, there are only few ministries which have implemented electronic records systems. Using the digital capability maturity model revealed that the Botswana Public Sector creates lots of digital records kept on computers, hard drives, compact disks and their preservation is not taken into consideration. There are no digital policies, the e-government strategy has no provision for digital records management. Some of the infrastructures for servers keeping digital records is very poor so data is likely to disappear, be manipulated, and tempered with.

7.6 Conclusion of the study

The conclusion of the study focuses on the research objectives and results. The Botswana Public Service showed that it has never been ready on issues of digital preservation despite the implementation of electronic systems in other ministries. This is a sign of lower capability maturity on e-government implementation.

7.6.1 Authenticity and reliability of trusted digital repositories

The study findings revealed that the Botswana Public Service was not committed to budgeting and establishing trusted digital repositories where digital records will be ingested and preserved to be used continuously in future. The digital records had no digital signatures and so manipulations and changes were possible leading to loss of integrity of records.

7.6.2 Types of systems for managing digital records

The study discovered that the Botswana Public Service lacked digital archiving systems, resulting in a lack of ability to preserve authentic digital

records. The systems did not have retention and disposal schedules and that led of digital records kept in the systems forever.

7.6.3 Creation and capture of digital records

The Botswana Public Service's creation and capture of digital records is haphazard and ad hoc and it does not endorse e-government initiatives because the vast majority of government departments lack records management systems. There were no standards for metadata which could assist in capturing and storage of data in the systems.

7.6.4 File formats and their long term preservation

It tends to be presumed that 'the most ideal alternatives for digital long-term preservation are non-proprietary, open format specifications delivered by international standard bodies. These formats are liable to remain accessible in future. Furthermore, PDF was preferable due to its reliability and the fact that PDF ensures that digital records remain accessible in future.

7.6.5 Policy guidelines and standards for management of digital records

The study discovered that the Botswana Public Service lacked consistent policies, proper procedures and knowledge as well as the implementation of national and international standards in the management of digital records.

7.6.6 Digital preservation strategies

The study concluded that the digital preservation strategies were known by the ICT officers and records personnel had limited knowledge. The Botswana Public Service digital records are likely not to be retrievable as the strategies used namely; migration, refreshing and data backup are not in the same standard with the new technological developments

7.6.7 Collaboration and engagements

The records and ICT personnel do not work together on digital preservation issues. The collaborative efforts made did not include departments such as the

museum. It also emerged that issues relating digital preservation were not discussed at all.

7.6.8 Technical expertise

The study found that the Botswana Public Service lacked the capacity to maintain digital records due to inadequate record preservation strategies. The implementers of the systems were not well versed on issues of authentic digital records. This resulted in officers not being able to fully participate in the implementation of e-government initiatives and digital preservation.

7.7 Recommendations of the study

7.7.1 Authenticity and reliability of trusted digital repositories

According to the study findings, the Botswana Public Service should create a trusted digital repository with preservation features. Preservation features include; technological, policy and institutional capacity to ingest records for archival storage, data management, access, dissemination as well as format migration through the Department of Information Technology and the Botswana National Archives and Records Services. The Botswana Public Service should embed digital signing of digital records in all digital preservation systems. This will assist in guaranteeing the authenticity and reliability of digital documents. Digital signing would mean that the archivist or the creator of digital records would have to sign all digital records. The integrity of electronic records could be checked by a verification of the signature of the creators.

7.7.2 Types of systems for managing digital records

The majority of ministries according to the findings of the study have not yet adopted systems to drive the e-government strategy. Digital records are at risk of being lost. The study recommends that all the ministries should implement systems for managing digital records that would improve service delivery and access to information online. In addition, the study recommends the

incorporation of records disposition requirements into the design of information systems and applications. This would ensure identification of electronic records of archival value from the time a record is created. The study recommends the use of digital signatures.

The electronic evidence act (2014) 7. 1 (b) states that ‘if the electronic record contains an electronic signature that was added when the electronic record was generated in its final form can be used to make sure the electronic record has not changed since that time of creation. This shows that the electronic evidence act of 2014 supports the use of an electronic signature as evidence. Furthermore, the government IT infrastructure should eliminate or phase out outdated servers, websites, and software.

7.7.3 Creation and capture of digital records

According to the study findings, digital records in Botswana Public Service should be generated accurately and trusted for decision making for as long as they are required. This can be done through the review of the National Archives Act, standards and models that will support the authenticity and trustworthiness of digital records. The National Archive should digitalise all archive collections as they are important to the cultural and political history of Botswana. They should be made available under an open license.

7.7.4 File formats and their long term preservation

The study recommends that the Botswana Public Service should adopt and use the portable document format- Archival (PDF/A) which was established by the International Organization of Standardization as the ISO 19005 for long term preservation of electronic records. This standard ensures sustainability and easy recovery of content. Portable Document format records are more vulnerable to threats. This is because Portable Document formats are used globally due to their multi-platform document formats portability and interoperability on different devices, making software simpler to install,

customize and use (Bindra 2011). As per the study findings, the government should procure open software solutions for digital preservation with relevant standards and protocols for all systems that create digital records through DIT and the e-government office. Thacker et al (2014) indicates that over the last two decades, open software (OSS) has played an increasingly important role in digital preservation. All organisations, including archival institutions, ministries, BOBS and BOCRA should collaborate to create models, international and local standards that meet digital preservation needs as per the findings of the study.

7.7.5 Policy guidelines and standards for management of digital records

The policies and practices in place in the Botswana Public Service were found to be insufficient in resolving the difficulties that organisations face when it came to handling digital information. As a result, it is suggested that the National Archives and Records Services Act be revised to include digital records management. Ngoepe and Saurombe (2016:27) are equally concerned about technological changes in the Southern African Development Committee region. These changes are increasing the amount of data saved and accessed in highly networked world. However, it is important to update archival legislation to embrace records that are created and stored in networked environments.

7.7.6 Digital preservation strategies

The study concludes that consumer demands for more robust and versatile tools for utilising and analysing stored digital resources should be factored into future research and creation of digital preservation strategies and methods. In order to preserve digital records, the Botswana Public Service can use the digital preservation capability maturity model.

7.7.7 Collaboration and engagements

The study observed that there was not enough collaborative effort in digital preservation. In addition, there were no partnerships with other institutions such as Museum department. According to the findings of the study, the Botswana Public Service should cooperate with other organisations including private companies and parastatals. This collaboration will help in gain exposure to new ideas, techniques and tools as well as the expertise and skills necessary to effectively maintain and manage digital resources.

7.7.8 Technical expertise

The study recommends the need to raise awareness about digital preservation problems among the records managers, archivists and senior management. Digital preservation should be seen as a priority to all ministries. Ministries should take immediate steps to avoid problems in the next coming years. Furthermore, the Botswana Public Service should provide staff with training on digital preservation operations and digital preservation components should be included in the curricula of training institutions throughout the country.

7.8 Proposed framework for the assessment of the digital maturity capability in the Botswana public sector to enhance e-government delivery.

The study's fifth (5) objective was to propose an effective framework for assessing the Botswana Public Service's digital maturity capability in order to improve e-government delivery. Authentic digital records are compliant to requirements, preserved, used, stored in a trusted digital repository and retrieved over time according to the proposed framework.

7.8.1 Explanation of the framework

The proposed framework for the management and assessment of the Botswana Public Service's digital maturity readiness aims to improve e-government delivery. The system outlines what the Botswana Public Service can do to

ensure that digital records are preserved for long term. The proposed strategic framework capabilities cover a wide range of perspectives and issues as the following:

- E-government
- Digital Preservation Strategy
- Digital Preservation Policy
- Access Controls
- Technical Expertise
- Collaboration and Engagements
- Integrated Systems
- Metadata and Standards
- Ingestion of Digital Records
- Trusted Digital Repositories
- Preservation Strategies

7.8.1.1 E-government strategy

The proposed framework recognises that Botswana's e-government policy did not address the problem of digital records preservation. The study found that the Botswana Public Service is still in the early stages of e-government implementation. The study recommends that the e-government policy be reviewed in order to integrate digital records preservation.

7.8.1.2 Digital preservation strategy

The framework recommends implementing a holistic plan to ensure that those who have significant impact on the existence, character or accessibility of digital records contribute to the achievement of that function. The study

discovered that there is no preservation strategy in place hence the need to establish one. The strategy should address the problem of digital continuity which ensures that digital records survive technological obsolescence, degradation and remain accessible to those who need them. To strengthen e-government services, the plan should take into account regulation, standards and infrastructure. Botswana Public Service should consider adopting digital preservation policies that foresee the future. This will include proper preparation for the transfer of digital records through platforms and formats as well as the introduction of controls, processes and obligation. All these are meant to ensure that digital records are accessible, useable and authentic.

7.8.1.3 Digital preservation policies

The results of the study revealed that there were no policies in place for the management of digital records. The study recommended that policies and procedures for the protection of digital records be established ahead of time. Access, use and reuse of digital records should all be addressed in the regulation. For successful and long term digital preservation programs and strategies, access, preservation and privacy controls are essential.

7.8.1.4 Technical skills

The framework suggests that technical skills are needed. Computer related tasks as well as the appraisal and collection of digital records would be among these abilities. These skills would help officers to function more effectively by allowing records staff and archivists to fully use desktop office resources such as word processors, spreadsheets and databases. These skills may be related to the ability to function well with others, specifically those who build and maintain records in both their active and inactive stage. In Botswana, public service records management practitioners should be able to take a holistic view of a repository activities and create a seamless workflow that removes unnecessary steps and improve quality and effectiveness. Officers will be able

to engage in wider business process re-engineering to ensure that their needs are addressed with this expertise.

7.8.1.5 Collaboration and engagement

The framework proposes a need for records professionals to work together. This involves forming collaborative networks of people from all over the world in a variety of disciplines. The ministries should work together with parastatals to develop constructive, supporting working relationships.

7.8.1.6 Integrated electronic systems

The study also discovered that the Botswana Public Service faces interoperability problem between e-government and digital records systems. This is a serious issue that has a significant effect on both e-government and e-digital records systems technological orientation. In the sense of the e-government strategy, the department of information technology and the e-government office should share this responsibility for ensuring smooth management of digital records preservation. Both hardware and software harmonization of systems should be included in the integration. Duplication of processes can also be avoided by integration.

7.8.1.7 Metadata and standards

A lack of standards for managing digital records was discovered in this study. The study recommends that standards and metadata be adopted to allow for the long term maintenance of digital records. Since Botswana Public Service uses non-integrated systems, this study proposes that information professionals need to share information in order for various systems to operate together in a technical context. This necessitates an appreciation of various criteria for different tasks. There will be guidelines for information administration, definition, exploration and preservation. These standards would aid in the packaging of data and the sharing of data between the

systems. Long- term digital preservation will be supported by metadata preservation, which will ensure the availability, identification, longetivity, renderability, understandability and authenticity of digital records over long periods of time. Standards compliance also allows an organisation to be audited and accredited.

7.8.1.8 Database preservation

The framework recommends that there be database preservation of digital records. The database will include all the contextual information explaining provenance, function and covering dates. The database will have a record of technical information, the ingestion process, and the transformations performed. A database schema, including both the table schemas and the set of constraints will be used to capture parts of the meaning of the data. The reports on the data ingested will improve the information preserved within the systems.

7.8.1.9 Trusted digital repositories

The framework emphasized the importance of using trusted digital repositories to handle digital records over time. This would make managing digital archives easier and ensure long- term preservation of archival materials. Over multiple generations of technology, trusted digital archives maintain the integrity and reliability of records. The digital repository will ensure that the users have access to digital records on the servers. This access will mean users have access to digital record, can create or supply a digital copy and download to servers via emails.

7.8.1.10 Ingestion of digital records

Data ingestion should be prioritised and categorized. This makes data flow smoothly in further layers in Data ingestion process flow. The picture of the proposed framework is on the next page.

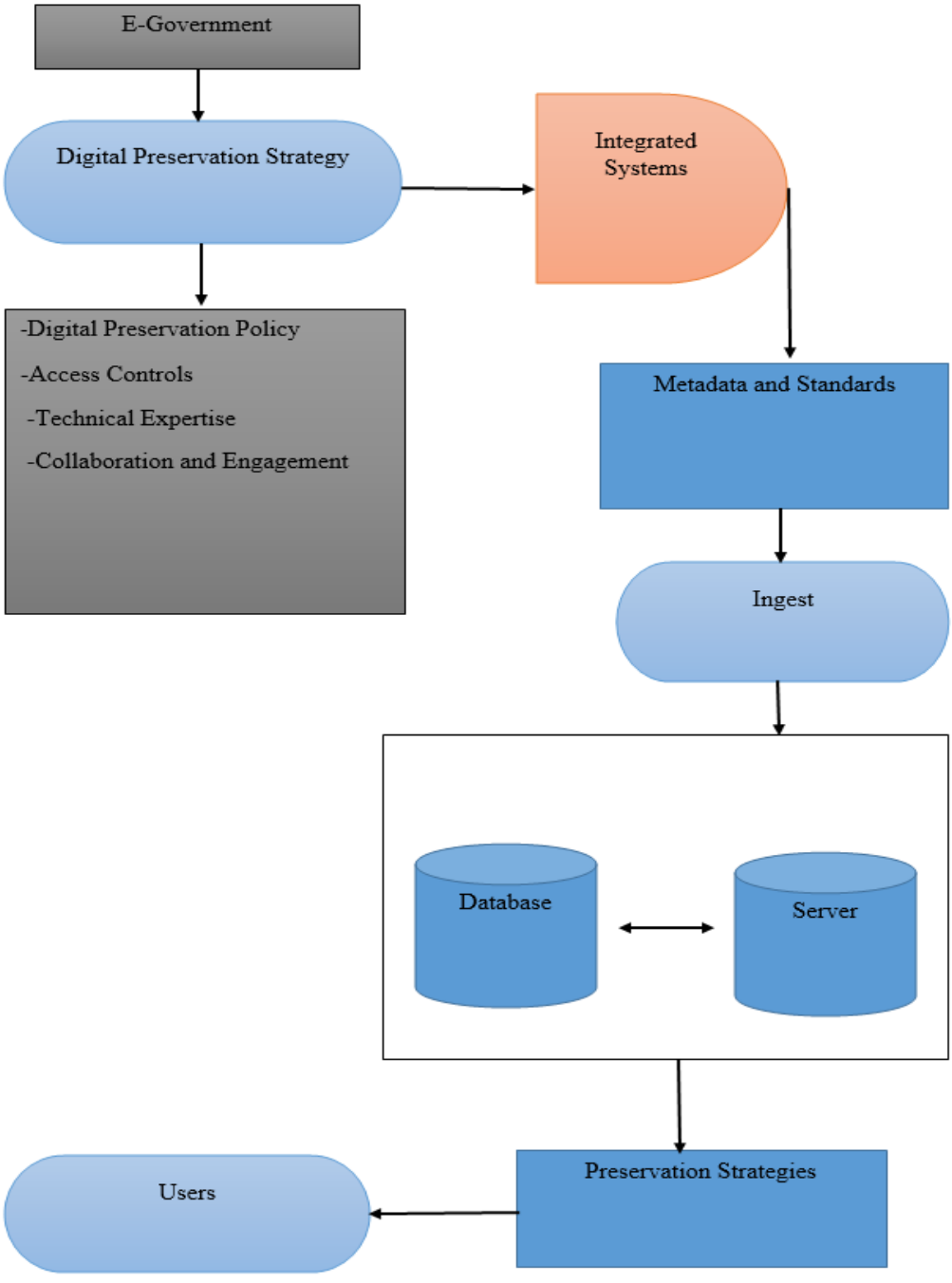


Figure 7.1 Proposed Framework for the Study

The proposed framework will ensure digital preservation authenticity, reliability and trustworthiness by providing protection of digital records from unauthorised access and alteration. In addition, through this framework proposed there will be processes and tools which will enable detection of unwanted changes within the systems. The systems that will be used will have active, up to date and properly maintained firewalls and viruses checking software. Permission right to users will be granted so that only authorised users can retrieve and use records. The audit trail which will allow users to query the system to provide the report to show which group was assigned, removed or had their level access adjusted. Furthermore, the proposed framework will provide digital continuity by ensuring the development and implementation of policies, strategies and capabilities of skilled staff for Botswana Public Service.

7.9 Implication for theory, policy & practice

The study assessed the digital preservation capability maturity readiness of the Botswana public service within the context of the e-government drive. The framework was to ensure digital preservation authenticity, reliability and trustworthiness with time. The study used the digital preservation maturity model to answer questions related to digital preservation policies, security, collaboration, storage, technical expertise, strategies and integrity provided by the Botswana public service. This study revealed that the Botswana Public service should collaborate with parastatals in the context of preserving the digital records.

7.10 Suggestions for further studies

Literature has shown that the majority of studies did not develop a framework to show the digital preservation maturity readiness model as e-government strategy is being implemented. The progress of e-government and digital preservation policies shows a knowledge gap hence a need for a comparative

study for the Botswana Public Service and academic organisations in Botswana. Future studies should include more respondents as this study was limited due to limited time and resources available to cover parastatals. Botswana Public Service should establish policies and procedures that will preserve, make data accessible, and retrievable continuously over time. The study unearthed that email communications were not preserved so there is a need for email structures in the Botswana Public Service. Other studies could look at the possibilities of implementation and operationalization of the framework.

7.11 Final conclusion

The study assessed the digital preservation capability maturity readiness in the public service in Botswana with the view to develop a framework to enhance e-government delivery**.** The ultimate aim is to ensure that there is digital continuity and e-government is sustained for the benefit of an open government and increased participatory citizenry. The study findings revealed absence of a preservation policy for managing digital records. The study findings uncovered lack of repositories or data centres. Digital records were kept in servers which were not compliant to any standard. There were few collaborations done by memory institutions. The majority of the records personnel preferred to work independently and consulted Botswana National Archives for guidance and support. The Botswana Public Service did not have any plan to preserve their digital records on cloud as the majority of records personnel lack technical skills to advice on the benefits of preserving digital records.

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APPENDIX

Appendix A. Introductory Letter Requesting Permission to conduct a Study

P O Box v 401

Ramotswa Village

12th January 2019

The Permanent Secretary

Ministry of Labour and Home Affairs

Gaborone

Dear Sir/Madam

Re: Application to Conduct Research – Ms. Keneilwe Porogo

I am writing to kindly ask for your permission to carry out a research on: A Strategic Framework for Digital Preservation Capability Maturity Readiness in the Context Of e-Government in the Public Sector in Botswana. I am a PhD student at the University of South Africa (Department of Information Science) and a Principal Records Manager II at the Ministry of Minerals, Green Technology and Energy Security (Coordinator of Records and Archives Management). The aim of my study is to develop a strategic assessment framework that ensures digital continuity.

I am therefore kindly requesting to conduct interviews, administer questionnaires, analyse documents relating to e-government and interview senior management. Your assistance to make this study a success would be greatly appreciated.

Yours Faithfully

_____

Keneilwe Margret Porogo

Appendix B: Consent Form

Dear Participant,

I am kindly inviting you to participate in this research. The aim of my study is to develop a strategic assessment framework that ensures digital continuity.I am a Doctor of Literature and Philosophy student in the department of Information Science with the University of South Africa under the supervision of Professor Trywell Kalusopa.

I wish to inform you that all your responses will be kept confidential, responses will not be attributed to specific respondents and the information supplied shall be used only for the purpose of this research.

Should you have any queries or seek further clarity about the study, please do not hesitate to contact the researcher on mobile number: 71573100.

Please to confirm

I confirm that I have read and understood what the study is about and had opportunity to ask questions. ☐

I understand that my participation is voluntary and that I am free to withdraw at any time. ☐

I agree to take part in the above study. ☐

I agree to the interview being audio recorded. ☐

Note that the recording will be used for the purpose of the study.

_____ _____ _____

Name of Participant Signature Date

_____ _____ _____

Name of Researcher Signature Date

Appendix C: Ethical Clearance

UNISA

DEPARTMENT OF INFORMATION SCIENCE RESEARCH ETHICS REVIEW COMMITTEE

Date: 14 September 2017

Ref #:
2017_KMPorogo_61145394_001
Name of applicant: KM Porogo
Student #:X
Staff #:

Dear KM Porogo,

Decision: Ethics Approval

Name: Title and name of principle applicant, address, e-mail address, and phone number KM Porogo, Unisa Information Science, 61145394@mylife.unisa.ac.za; and +26771573100

Proposal: A strategic framework for digital preservation capability maturity readiness in the context of e-Government on the public sector in Botswana.

Qualification: Doctor of Philosophy in Information Science

Thank you for the application for research ethics clearance by the Department of Information Science Research Ethics Review Committee for the above mentioned research. Final approval is granted for *4 years*.

For full approval: *The application was reviewed in compliance with the Unisa Policy on Research Ethics by the Department of Information Science Research Ethics Review Committee on 14 September 2017.*

The proposed research may now commence with the proviso that:

1) *The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.*
2) *Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the Department of information Science Ethics Review Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.*

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

Appendix D: Research Permits

PRIVATE BAG 00434
GABORONE
BOTSWANA

Republic of Botswana

TELEPHONE: + (267) 3682000
FAX: + (267) 3911591/3913055

MINISTRY OF LAND MANAGEMENT, WATER & SANITATION SERVICES

CMLWS 1/ 17 /4 III (7)

21 February, 2019

Miss Keneilwe M. Porogo
P.O. Box v401
Ramotswa

(Attention: Miss Porogo)

RE: APPLICATION FOR RESEARCH PERMIT BY MORATI MPALO TITLED, "A STRATEGIC FRAMEWORK FOR DIGITAL PRESERVATION CAPABILITY MATURITY READINESS IN THE CONTEXT OF E-GOVERNMENT ON THE PUBLIC SECTOR IN BOTSWANA".

The above subject matter refers.

- Permission is being granted to conduct research titled "A Strategic Framework For Digital Preservation Capability Maturity Readiness in the Context of E-Government on the Public Sector in Botswana".
- We trust the research programme will be conducted in accordance with local and international ethical norms and as per research guidelines of July 2004 issued by the Office of the President attached herewith.

PRIVATE BAG 00434
GABORONE
BOTSWANA

Republic of Botswana

TELEPHONE: + (267) 3682000
FAX: + (267) 3911591/3913055

MINISTRY OF LAND MANAGEMENT, WATER & SANITATION SERVICES

CMLWS 1/ 17 /4 III (7)

21 February, 2019

Miss Keneilwe M. Porogo
P.O. Box v401
Ramotswa

(Attention: Miss Porogo)

RE: APPLICATION FOR RESEARCH PERMIT BY MORATI MPALO TITLED, "A STRATEGIC FRAMEWORK FOR DIGITAL PRESERVATION CAPABILITY MATURITY READINESS IN THE CONTEXT OF E-GOVERNMENT ON THE PUBLIC SECTOR IN BOTSWANA".

The above subject matter refers.

- Permission is being granted to conduct research titled **"A Strategic Framework For Digital Preservation Capability Maturity Readiness in the Context of E-Government on the Public Sector in Botswana".**
- We trust the research programme will be conducted in accordance with local and international ethical norms and as per research guidelines of July 2004 issued by the Office of the President attached herewith.

PRIVATE BAG 008
GABORONE
BOTSWANA

TEL: (+267) 3950100
FAX: (+267) 3956086

REPUBLIC OF BOTSWANA

MINISTRY OF FINANCE AND ECONOMIC DEVELOPMENT

REF: MFED (c) 71/6/25 Vol.25 (17)

19th February 2019

TO: Keneilwe Porogo

Dear Madam,

REQUEST FOR PERMISSION TO UNDERTAKE DATA COLLECTION FOR A DOCTORAL RESEARCH

1. Reference is made to your letter dated 25th January 2019, wherein you requested permission to do a research project.

2. You are herewith granted permission to do research on **"A Strategic Framework for Digital Preservation Capability Maturity Readiness in the Context of e-Government in the Public Sector in Botswana".**

3. The following conditions must be complied with subsequently;

   3.1 Upon completion you submit a copy of your research paper to the Ministry Library.
   3.2 Kindly note that this permission is valid from 1st March 2019 to 30th April 2019.
   3.3 Permission to entry of premises is limited to authority of those concerned.
   3.4 You are to conduct the research according to the approved application taking into account the above conditions.
   3.5 Failure to comply with the above will result in immediate cancellation of the permit given.

4. Please report to the Principal Records Manager II and Manager – Information Technology who will make the necessary arrangements for your research.

5. Thank you.

Yours faithfully

Gaolathe Moyo
For/ PERMANENT SECRETARY

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MINISTRY OF EMPLOYMENT, LABOUR PRODUCTIVITY & SKILLS DEVELOPMENT

Ref: MELSD 1/16/1 (38) **DATE:** 14 February 2019

Keneilwe Margret Porogo
P O Box v 401
Ramotswa

Dear Sir

PERMISSION TO UNDERTAKE A SURVEY

This serves to acknowledge receipt of your letter dated 25th January 2019, where you requested to conduct a survey on: **A Strategic Framework for Digital Preservation Capability Maturity Readiness in the Context Of e-Government in the Public Sector in Botswana.**

Your request is granted based on the following conditions;

1. The material should be used for educational purposes only and not be released for public consumption.

2. Copies of videos/publications produced as a result of this project should be deposited with the **Ministry of Employment, Labour Productivity and Skills Development.**

Thank you.

Yours Faithfully

Lebogang Tlhaloso
For/Permanent Secretary

Appendix E: Questionnaire for Records Managers

A Strategic Framework for Digital Preservation Capability Maturity Readiness in the Context of e-Government in the Public Sector in Botswana

Instructions: Please tick against appropriate choice(s) for each question and/or complete the entry spaces (where applicable).

Contact Information …….

Position held……

Number of Years/Experience in the position……

1. What types of digital records do you receive or are you most likely to be storing in your digital preservation system?
    a) Email
    b) CD'S
    c) Audio and Video
    d) Photographs
    e) Others specify……
2. What type of metadata are you creating?
    a) Descriptive
    b) Structural
    c) Administrative
    d) All three
3. What type of metadata schema(s) are you currently using?
    a) MPEG-7-Moving Picture Experts Group- for digital Audio and Video
    b) EAD- Encoded Archival Description

c) DCME- Dublin Core Metadata Elements

d) Metadata Encoding and Transmission Standard (METS)

e) Other specify…….

4. In which file format are digital records held in your agency? Tick as appropriate

a) Bitmap Graphic Files (JPG, TIFF, PNG)

b) Markup Language (HTML,SGMI,XHXMI, XML)

c) Text Files (PDF, RTF,TXT,DOC)

d) Spreadsheet Files (CSV, XLSX)

e) Vector Graphic Files (EPS,CGM,SHP,DOOF)

f) Video Files (MPFG, AVI,WMV, Real Network)

g) Other Specify……..

5. What do you believe is essential to proving the authenticity of digital reco rd?

a) Name of the Author

b) Digital Signature

c) File Identifier or Classification Number

d) Date of Creation

e) Other Specify……

6. Have you ever considered issues related to authenticity in digital records of your ministries?

a) Yes

b) No

7. Have you ever been in a situation where you have needed to prove that the authenticity of digital records is important?

a) Yes

b) No

8. Which of the following do you use in cryptographic validation techniques?

    a) Digital Signatures

    b) Trusted time stamps

    c) Checksums

    d) Secure Transmission

    e) Hash Digest

9. Do procedures exist for regular transfer of records from current to semi-current or non-current storage?

    a) Yes

    b) No

10. Have you ever conducted appraisal of digital records?

    a) Yes

    b) No

11. Do your organization's records policies define authenticity of digital reco rds

    a) Yes

    b) No

    c) Don't know

12. When you create or manage digital records, how often do you rely on the use classification schemes and retention and disposal schedule to ensure authenticity?

    a) At all times

    b) Most of the time

    c) Infrequently

    d) Sometimes

13. How your agency does protects digital records from unauthorized access and tempering/viruses. Tick as many options that apply to your department/ministry?

a) Through the use of ID cards and encrypted passwords

b) Use metadata is used to control access to records

c) Use of firewalls and digital signatures

d) Others specify _____

14. What type of storage do you use to preserve your digital records?

a) Stored as part of a digital preservation repository system

a) Outsourced on contract to a service provider

b) Stored on CD-ROM or DVD

c) Stored on tape (other than backups)

d) Stored on tape drive or hard disk of computer, with backup

e) Stored on server file storage, with backup -Stored on a content management system, with backup

f) Via the internet

15. Where is your storage located?

a) Premises

b) Hosted at Department of Information Technology

c) Other specify……

16. Does your storage program include: (Please check all that apply.)

a) The use of high quality storage media

b) An access-controlled area for the machines and media on which files are stored

c) An environmentally-controlled area for storage media

d) A disaster recovery plan

e) A media testing program

f) A media refreshing/migration plan

g) Backup

h) Offsite storage for backups

i) Other (Please describe.)

17. Do you see cloud storage as part of your storage architecture?

    a) Yes

    b) No

18. Do you apply security measures to protect your digital records from access and accidental destruction?

        a) Yes

        b) No

19. If ‘yes’ in question 18, which of the following security measures do you use?

        a) Online Password

        b) Desktop Password

        c) Offline

        d) Others specify…….

20. Does your Ministry or Departments have a written preservation policy that guides you in the management of digital records?

    a) Yes

    b) No

21. If ‘Yes’ in question 20, does policy provide guidelines for: (check all that apply)

        a) acquiring materials in digital form

        b) converting materials from print to digital form

        c) storage

d) refreshing

e) Migration

f) None of the above

22. At what stage is your preservation policy?

a) Development Stage

b) Approved

c) Not yet developed

23. Is the policy linked to the national policy?

a) Yes

b) No

24. How do you work with Botswana National Archives and Records Services to ensure that the policy is adequately implemented?

a) Routine Basis

b) Bi-annually

c) Quarterly Basis

25. Was the policy shared within your organisation and its stakeholders?

a) Yes

b) No

c) Not Sure

26. Which of the following digital preservation strategies has your institution implemented?

a) Migration

b) Refreshing Data

c) Emulation

d) Data Backup

e) Maintenance of Legacy Equipment

f) Digital Preservation Solution

g) Cloud Computing

27. How often are your digital records audited for compliance with international practice?

a) One Year

b) Two years

c) Don't know

28. Have you implemented a digital repository into your program?

a) Yes

b) No

29. Which institutions do you collaborate with regarding digital preservation of records?

a) Botswana Bureau of Standards

b) Botswana National Library Services

c) Botswana Broadcasting Services

d) Botswana National Broadcasting

e) Botswana National Archives and Records Services

f) Other Specify……..

30. Which standards does your organisation benchmark against its digital preservation?

a) ISO 14721-2012- Open Archival Information System Reference Model (OAIS)

b) ISO 16363-2012-Audit and Certification of trustworthy digital repository

c) ISAD (G) International Standard Archival Description

d) ISAAR (CPF): International Standard Archival Authority Record for Corporate Bodies, Persons and Families

e) Other specify……..

31. Is the current technological infrastructure of your organisation adequate to build and/or sustain a digital preservation programme, with requisite upgrading and enhancement over time?

    a) Yes

    b) No

    c) Don't Know

32. Are there staff at your institution specifically charged with digital preservation responsibility?

    a) Yes

    b) No

    c) Don't know

33. Do records management staff have the training or experience to develop and implement tools and procedures for managing digital records?

    a) Yes

    b) No

34. Does your technical expertise adequate to develop and maintain a digital preservation programme?

    a) Yes

    b) No

35. Does your institution currently utilize outside sources of expertise for preservation of digital materials (e.g., consultants, contracts)?

    a) Yes

    b) No

36. What methods does your institution plan to use over the next 3 years to increase the level of staff expertise with digital preservation? (check all that apply)

    a) Local courses in computer or digital technology

    b) Training provided by professional organizations

    c) Training provided by vendors

    d) Independent study/assessment

    e) Hire staff with digital knowledge or experience

    f) Hire consultants

37. Does your organisation's repositories for digital records have security measures and access protocols that protect the records?

    a) Yes

    b) No

38. What percentage of your digital collection is available online?

    a) 50%

    b) 70%

    c) 100%

    d) 0%

39. Does your repository have security and other mechanisms in place to ensure the integrity of objects against intentional or accidental security threats?

    a. Yes

    b. No

    c. Don't know

40. How will you rate your Ministry / Departments status in terms of digital preservation capability? Tick (Where Applicable)

	Capability Level	Index Score
a)	Nominal	0
b)	Minimal	Between 1-15
c)	Intermediate	Between 16-30
d)	Advanced	Between 31-45
e)	Optimum	Between 46-60

Thank you for taking the time to share your views.

Appendix F- Interview for Senior Executive/Management Officers

A Strategic Framework for Digital Preservation Capability Maturity Readiness in the Context Of e-Government in Botswana Public Service in Botswana

Instructions: Please tick against appropriate choice(s) for each question and/or complete the entry spaces (where applicable).

Contact Information …….

Position held……

Number of Years/Experience in the position……

1. What are the main types of digital records created by your ministry?
2. How can staff who are processing email adhere to archival actions for acquiring, appraising, processing, and preserving email?
3. Which legislative instruments and policy documents regulate the management of digital records in the public service of Botswana?
4. How does digital records preservation fit within an organisation-wide e-government framework?
5. Does your ministry use ICT in their operations?
6. In your view, does the use of ICT support the preservation of digital records? (Explain)
7. Please explain the situation where you needed to prove that the authenticity of digital records is important?
8. Can you describe or specify how you judge whether a digital record is authentic.
9. What repository arrangements or projects for digital preservation are there in your ministry?
10. Kindly elaborate on any strategic document that could be interpreted as supporting digital preservation?

11. What challenges does your Ministry face in preserving digital records?
12. What factors influence the length of time for which a record needs to be preserved?
13. What recommendations/ suggestions can you make in the preservation of digital records of your ministry?

Appendix G- Interview Guide For Head of Records Management Units at Botswana National Archives and Records Services

A Strategic Framework for Digital Preservation Capability Maturity Readiness in the Context of e-Government in the Public Sector in Botswana

Instructions: Please tick against appropriate choice(s) for each question and/or complete the entry spaces (where applicable).

Contact Information …….

Position held……

Number of Years/Experience in the position……

1. Which legislative instruments and policy documents regulate the management of digital records in the public sector of Botswana?
2. Botswana has an ongoing e-Government programme in place, how adequate are the legislative instruments and policy documents for the creation and maintenance of authentic digital records?
3. How does digital records preservation fit within an organisation-wide e-government framework?
4. Does your ministry use ICT in their operations?
5. In your view, does the use of ICT support the preservation of digital records? (Explain)
6. Are there any repository arrangements or projects for digital preservation in your ministry?
7. What factors influence the length of time for which a record needs to be preserved?
8. What security controls have you put in place to prevent unauthorized use of digital documents?
9. What criteria is used to reach the conclusion that digital records in NARMS have maintained their identity and integrity?

10. What is the overall assessment of your ministry digital capability maturity readiness in terms of infrastructure, staff expertise and competencies?
11. What challenges does your Ministry face in preserving digital records?
12. What recommendations/ suggestions can you make in the preservation of digital records of your ministry?

Appendix H: Interview for HOD Records Management

A Strategic Framework for Digital Preservation Capability Maturity Readiness in the Context of e-Government in the Public Sector in Botswana

Instructions: Please tick against appropriate choice(s) for each question and/or complete the entry spaces (where applicable).

Contact Information …….

Position held……

Number of Years/Experience in the position……

1. Which legislative instruments and policy documents regulate the management of digital records in the public sector of Botswana?
2. Botswana has an ongoing e-Government programme in place, how adequate are the legislative instruments and policy documents for the creation and maintenance of authentic digital records?
3. How does digital records preservation fit within an organisation-wide e-government framework?
4. Does your ministry use ICT in their operations?
5. In your view, does the use of ICT support the preservation of digital records? (Explain)
6. Are there any repository arrangements or projects for digital preservation in your ministry?
7. What factors influence the length of time for which a record needs to be preserved?
8. What security controls have you put in place to prevent unauthorized use of digital documents?
9. What criteria is used to reach the conclusion that digital records in NARMS have maintained their identity and integrity?

10. What is the overall assessment of your ministry digital capability maturity readiness in terms of infrastructure, staff expertise and competencies?
11. What challenges does your Ministry face in preserving digital records?
12. What recommendations/ suggestions can you make in the preservation of digital records of your ministry?

Appendix I: Interview for Information Technology Manager/Chief Information Technology Officer

A Strategic Framework for Digital Preservation Capability Maturity Readiness in the Context of e-Government in Botswana Public Service

Instructions: Please tick against appropriate choice(s) for each question and/or complete the entry spaces (where applicable).

Contact Information …….

Position held……

Number of Years/Experience in the position……

1. Does your ministry use ICT in their daily operations?
2. Does the application of ICT lead to the creation and use of digital records in your ministry? (Explain)
3. Does you ministry or departments have procedures for regular transfer of records from current, semi-current and non-current storage?
4. How has the government legislation and policies contributed to the growth of digital records?
5. In your view, does the use of ICT support the preservation of digital records? (Explain)
6. In which standard format are digital records held by your ministry?
7. What repository arrangements are there for digital preservation in your ministry?
8. What factors influence the length of time for which a record needs to be preserved?
9. What security controls have you put in place to prevent unauthorized use of digital documents?
10. How often do you conduct system audit for compliance with international best practices?

11. What is the overall assessment of your ministry digital capability maturity readiness in terms of infrastructure, staff expertise and competencies
12. What do you see as the main barriers to your practical and sustainable solution to digital preservation in your ministry?
13. What challenges does your ministry face as current factors threats to the loss of digital material?
14. Does your organisation have adequate organizational and technical expertise to develop and maintain preservation programme?
15. What preservation strategies is used by your ministry or departments in the preservation of records?
16. Does your ministry have data infrastructure or facility for the preservation of digital records?
17. Are there documented procedures for data migration?
18. How does your ministry deal with issues of reliability and authenticity as digital evidence of digital preservation in your agency?
19. Does your ministry have backup strategies for the preservation of digital records?
20. What actions has your ministry undertaken to extend the life of digital material that is threatened by obsolescence of file formats, storage media, and the supporting hardware or software?
21. Does your organisation store its digital records in a central repository and use a classification scheme, indexes and finding aids to access them?

22. What content are you placing in the repository?
23. How do you provide access to your digital collections?
24. Who have access your collections?
25. Does your repository have security and other mechanisms in place to ensure the integrity of objects against intentional or accidental security threats?
26. Which institutions do you collaborate with regarding digital preservation of records?
27. How are you managing fixity across digital objects?
28. What challenges is faced by your ministry in preservation of digital records?
29. What recommendations/ suggestions can you make in the preservation of digital records of your ministry?

Appendix J: Observation Checklist

Name of the Ministry: _____

Date of Observation: _____

Criteria	**Evidence (Documents) Examined**	**Findings**	**Results**
Digital preservation mandate aligned to e-government strategy			
Equipment's for creation, capture, of digital records			
Management of metadata and related reports			
Written policies and procedures governing the management of the digital records system			
Documentation about the record system (design, operation, management, etc.)			
Written policies and procedures governing digital records			
Repository has a commitment that reflects long term retention and access to digital records			

Information about the software used to create and manage the digital records			
Information about actions taken to preserve the digital records			
Information about changes made to the digital records, (e.g. migration, normalization, etc.)			
Classification scheme and/or file plan			
Retention and disposition schedules			
Access controls or security measures			
Audit logs			
Cryptographic validation techniques (e.g. digital signatures, hash digests,)			