UTILISING ARTIFICIAL INTELLIGENCE TECHNOLOGY FOR THE MANAGEMENT OF RECORDS AT THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH IN SOUTH AFRICA

BY

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ABSTRACT

Artificial intelligence technology is used in organisations to increase operational efficiencies and effectiveness. In a similar fashion, it can be used to manage records effectively and efficiently because artificial intelligence technology can perform records management activities quicker and faster than human intelligence. With the advent of artificial intelligence technology, records management practitioners should rather focus on planning effective strategies to develop records management programmes than on the activities that can be discharged through robotic machines. This study intended to address the current records management challenges which include system overload and crash. Artificial intelligence technology would ensure that records are managed effectively and efficiently. This study opted for a mixed methods research approach with a convergent design to investigate the utilisation of artificial intelligence technology for the management of records at the Council for Scientific and Industrial Research. The researcher opted to use a mixed methods research approach for this study because it cuts across multidisciplinary disciplines which can be effectively researched using a single approach. Records management theories, the technology acceptance model and the embedded system theory concepts were used to conceptualise the framework of the study. The sampled population of the study included one portfolio manager, one records manager, three professional repositories and indexers, two archives technicians and one data librarian. Data collection methods included focus group workshops, interviews, questionnaires, document analysis and observation. System analysis was used as a lens to review the current records management system. Quantitative data was presented in a descriptive way through tables and figures and qualitative data was presented through content analysis. The findings were integrated to ensure that the outcomes of the study were achieved. The findings revealed that records were not effectively managed because there was no reliable records management system. The Council for Scientific and Industrial Research used multiple systems and users did not know where to start when searching for records. However, this study advocated for the utilisation of artificial intelligence technology to manage records services effectively such as the automated digitisation, automated classification, and quick retrieval and disposal of records. The Council for Scientific and Industrial Research had no resources to utilise artificial intelligence technology to manage their records. A framework that would assist in adopting and utilising artificial intelligence technology for the management of records was recommended as a framework will provide guidance to the Council for Scientific and Industrial Research on how artificial intelligence

technology could be effectively implemented to efficiently manage the records. The study adds value to the prevailing theoretical and conceptual phenomena that form the perpetual discourse on the application of artificial intelligence technology for the management of records. The study also adds value by recommending a framework to apply artificial intelligence technology in the records management industry at the Council for Scientific and Industrial Research. The researcher could not include other research institutions in South Africa due to time limitations. Other researchers can focus on exploring the study in other research institutions in South Africa.

Keywords: artificial intelligence technology, robotic machines, records management, Council for Scientific and Industrial Research, digitisation, automated classification, electronic records, paper-based records, digital records

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DEDICATION

This study is devoted to my late grandmother, Anna Mantji Modiba, my wife Mahlatse Modiba, and my children, Kopano and Omatla Modiba.

Above all to God Almighty,
the one who gave me power, strength,
and courage to remain victorious in all circumstances
"Omnipresent, Omniscient and Omnipotent God"

DECLARATION

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Utilising artificial intelligence technology for the management of records at the Council for Scientific and Industrial Research in South Africa

I affirm that the above thesis is my project and all the sources I have utilised or cited have been indicated and acknowledged using complete references.

Furthermore, I affirm that I submitted the thesis to originality checking and that it falls within the accepted requirements for originality.

I also affirm that I have not recently submitted this project, or part of it, for examination at Unisa for another qualification or at any institution of higher education.

Mr Mashilo Modiba

18 October 2021

Date

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4IR	Fourth industrial revolution
AI	Artificial intelligence
AIT	Artificial intelligence technology
ARC	Agricultural Research Council
ATU	Attitude towards use
CCTV	Closed circuit television
CSIR	Council for Scientific and Industrial Research
DMS	Document Management System
ECTA	Electronic Communication and Transactional Act, No. 25 of 2002
EDRMS	Electronic Document and Records Management System
EIM	Enterprise information management
ERMS	Electronic Records Management System
HI	Human intelligence
HSRC	Human Science Research Council
ICT	Information communication technology
IT	Information technology
LDAP	Lightweight Directory Access Protocol
LIS	Library and information science
MERGB	Managing electronic records in governmental bodies
MISS	Minimum Information Security Standards
NARSSA	National Archives and Records Service of South Africa
NARSSA Act	National Archives and Records Management Service of South Africa Act, No. 43 of 1996
NRF	National Research Foundation
NLP	Natural language processing
OAES	Object Analysis for Embedded System Theory
OCR	Optical character recognition
PAIA	Promotion of Access to Information Act, No. 2 of 2000
PDF	Portable document format
TAM	Technology acceptance model
TRA	Theory of reasoned action

RMPM	Records Management Policy Manual
SAMRC	South African Medical Research Council
PII	Private identifiable information
PAJA	Promotion of Administrative Justice Act, No. 53 of 2000
POPI Act	Protection of Personal Information Act, No. 4 of 2013
Unisa	University of South Africa

CHAPTER ONE

INTRODUCTION: SETTING THE SCENE

1.1 INTRODUCTION AND BACKGROUND OF THE STUDY

Artificial intelligence technology (AIT) is growing universally in the wake of the fourth industrial revolution (4IR). The 4IR designates a universe where people move among digital spheres and online authenticity with the usability of interconnected technology such as blockchain technology, big data, cloud computing, artificial intelligence (AI) and robotics, internet of things, and web of things to manage their lives (Liao, Deschamps, Loures & Ramos 2017; Bakogiannis, Mytiliuis, Doka & Goumas 2020; Holland 2020; Manesh, Pellegrini, Marzi & Dabic 2020; Chung 2021; Lund 2021). Big data, blockchain and cloud computing, for example, are utilised for the provision of uninterrupted services and for maximum secured storage capacity in the organisation (Bakogiannis et al. 2020; De Koker & Du Plessis 2020; Ayodele & Kajimo-Shakantu 2021). The 4IR technologies are used to provide effective and efficient services in areas were human intelligence (HI) cannot be performed (Xu, David & Kim 2018; Kim 2020). As a result, the 4IR has led to the advancement of production processes, software and AI that can be utilised to automate and digitise services, and provide these services through robotic machines (Mullon 2019; Manesh et al. 2020; Iqbal & Yadaw 2021; Tella, Olaniyi & Dunmade 2021).

Disruptive technologies such as AI and robotic machines are used where it is hazardous for HI or where companies want to maximise production (Ratten 2020; Kalaiselvan, Sharma & Gupta 2021). Therefore, AIT is taking over in different spheres of people's lives and it performs more hazardous activities in a hazardous environment, but its standards of functioning surpass those of HI capability (Jackson 2011; Buchanan, Howitt, Wilson, Booth, Risling & Bamford 2021; Vaishali 2021). AIT is ideal because it has the ability to accomplish activities that have up to now been accomplished by HI quicker, faster and cheaper (Liu 2011; Brundage 2018; Ripcord Company 2019; Jarrahi 2019; Bozkurt, Karadeniz, Baneres, Guerrero-Roldan & Rodriquez 2021). AIT has an impact on an extensive range of disciplines, including

business, aviation, industry, surgery, medicine, archives and records management, education and many related fields (Ali, Naeem & Bhatti 2020).

Looking at the situation in China, AIT such as robotic machines were used to assist in the fight against the deadly coronavirus, which causes the illness covid-19 (Heilweil 2020). Robotic machines were used to diagnose, provide treatment and provide foods to the infected patients who were in quarantine in hospitals (Vichitkraivin & Naenna 2021). Therefore, patients did not have physical contact with health practitioners and that helped to reduce the spread of coronavirus (Heilweil 2020). The other advantage is that the AIT can also perform any kinds of functions in a short space of time. What HI can perform in a day, AIT such as a robotic machine could perform in few hours (Yudkowsky 2008; Jackson 2011; Bowser, Sloan, Michelucci & Pauwels 2017; Ripcord Company 2019).

AIT is also entering the library and information sector through robotic machines, chatbots, natural language processing (NLP), big data and text data mining (Cox, Pinfield & Rutter 2019; Dormehl 2019; Ali et al. 2020). For example, the University of Pretoria library is using Libby robot to provide the reference and information services in their libraries (Mathibela 2019). However, it may be expensive to apply and utilise AIT for the provision of library services and the management of records, but once adopted and applied, it would save costs related to the continuous procurement of systems that might not be interconnected but are expected to perform common functions such as records management and library services (Atzori, Lera & Morabito 2010; West 2015; Bostrom & Muller 2016; EE Publishers 2017; Kim 2020).

The application of disruptive technologies such as AIT is a critical factor for archivists and records management practitioners to address challenges faced by records and archives management in South African public sector (Modiba, Ngoepe & Ngulube 2019). According to Christensen (2006), Martinez-Vergara and Valls-Pajola (2020), disruptive technologies denote technological innovations, innovative products or innovative services that involve a "disruptive" strategy response that habitually serves to overhaul the continuous central technologies or status quo products in a vicinity. These disruptive deviations have also affected the records and archives management industry and the 4IR can be observed from technological innovation as a solution to

the challenges that the archives and records management sector faces (Prigg 2017; Ahmat & Hanipah 2018; Kim 2020). Organisations across the universe consider using AIT to accomplish numerous functions that are currently being discharged by individuals, particularly for records classification, storage and retrieval (Jarrahi 2019). Organisations in the developing countries should adopt and utilise AIT in the management of archives and records management sections to realise all its holistic benefits. Benefits such as provision of effective and efficient archives and records management services would be realised when AIT is properly adopted (Alex 2020).

The application of AIT would enable organisations to function effectively and efficiently in their area of operation, which would assist in avoiding audit qualifications in areas where records management is concerned (Alex 2020). AIT would also ensure that records are easy to retrieve, are protected by encrypted security codes and are stored in the cloud for reliable maximum storage and retrieval (Liu 2011). However, the challenges that organisations face when managing records expose them to failure. Hence, AIT should be harnessed to address any challenges related to archives and records management (Alex 2020). Problems that can be alleviated by making use of AIT include elimination of duplication of records, loss of records, unreasonable time consumption to locate records, and system overload and crash. This also includes records sent to unintended recipients inside and outside the institution and a lack of skills to utilise AIT by records management practitioners. However, on the issue of not having skilled personnel, organisations using AIT could then upskill and reskill their available manpower to be creative and able to work with the new technological infrastructure. They would also assist them to perform other strategic records management functions within the organisation (Prigg 2017; Maderer 2017; Iron Mountain 2019b; Jarrahi 2019).

However, the meaning of AIT has changed over the years since the 1950s and it is continuing to grow. Techopedia (2018) and Vaishali (2021) define AIT as machine-learning devices such as robots, programs and software that are being utilised globally across different disciplines to perform various functions (Singh 2008; Muller 2020). In the United States of America, AIT is widely utilised to digitise, locate and retrieve records (IBA Global Employment Institute 2017; Ripcord Company 2019). Therefore,

in the developing countries, AIT should be adopted for effective and efficient management of records and archives, as is the case in the developed countries.

EE Publishers (2017); Modiba et al. (2019) argue that AIT is not widely applied and utilised in South Africa, especially for archives and records management services due to a lack of empirical research to support the adoption in the developing countries. However, EE Publishers (2017) and Modiba et al. (2019) further argue that the application of AIT is an area that should be explored in South Africa so that it could be adopted and applied for effective and efficient records management. In South Africa, most organisations use both manual and electronic records management systems (ERMSs) to manage and render archives and records management services, although there are challenges linked to the use of such systems (Marutha 2011; Luthuli & Kalusopa 2017; Modiba et al. 2019).

Marutha (2011); Luthuli and Kalusopa (2017) further articulate that the problems continue because current manual and ERMSs across various institutions are loaded with enormous administrative responsibilities. Lor and Snyman (2005) also indicate that such problems include the misfiling of records, loss of records, time consumption during the digitisation of paper-based records and the inability to retrieve required records. Audit qualifications are awarded to organisations, especially in areas where records are required as support documents. Moreover, organisations are incapable to manage their records effactually and proficiently and services are negatively affected (Ngoepe 2014). Poor management of records has a negative influence on the economy, governance and the delivery of services in various organisations across South Africa (Luthuli & Kalusopa 2017).

The utilisation of AIT might help in resolving the problems that are experienced by workers in South Africa with the present records management systems (EE Publishers 2017). Modiba et al. (2019) also suggest that AIT could be used to alleviate some of the problems faced by record practitioners when managing records and archives in South Africa. Hence, it is essential to investigate the utilisation of AIT to address the problems associated to the management of records in South Africa. The application of AIT is crucial in making sure the records are managed appropriately for ease of access

and use (Liu 2011; EE Publishers 2017; Kaur & Sigh 2017; Techopedia 2018; Alex 2020).

In the context of library science, Xiaotu is an example of AI (Yao, Zhang & Chen 2015). Xiaotu is a female robot used in libraries around China to provide library services to the users (Yao et al. 2015). However, this study is not focused on library services but on archives and records management services. Therefore, in the context of archives and records management, Ripcord is an example of a robot used in the United States of America for digitisation and retrieval of records (Ripcord Company 2019; Demaitre 2020).

The Council for Scientific and Industrial Research (CSIR) has moved towards embracing digital technologies by adopting an electronic document and records management system (EDRMS) to manage their electronic records. An EDRMS is a content management system characterised by an integrated machinery of document management and records management (Marutha & Ngulube 2018). However, EDRMS requires meticulous human intervention for it to manage the records effectively and efficiently. However, AIT needs less human intervention; hence, they manage records effectively and efficiently, as evidenced by empirical studies conducted in the United States of America and China (Jiang, Jiang, Zhi, Dong, Li, Ma, Wang, Dong, Shen & Wang 2017; Ripcord Company 2019). This study made use of the concepts of life cycle model, records continuum, technology acceptance model, object analysis for embedded system theory to develop AI and records management inclined framework. The framework is used to explore the application of AIT for the management of records at the CSIR to make sure that records are managed effortlessly. This chapter especially puts things into clear perspective by offering the context of the study, problem statement, objective and the definition of key concepts.

1.1.1 Context of the study

As indicated in the Scientific Research Council Act, No. 4 of 1988, the CSIR is a superlative African research and innovation organisation started through the Scientific and Industrial Council Act, No. 33 of 1945, of South Africa. Section 4(d) of the acts states that the function of the CSIR will be to publish information regarding its

operations and create facilities for the storage, collection and distribution of information regarding the research. The CSIR undertakes directed, multidisciplinary research and high-tech invention that subsidises the development of the quality of life for South Africans (CSIR 2018). The organisation makes a positive contribution to sustaining the government's initiatives via absorbed research relating to the country's developmental priorities, the institution's directives and its science, engineering and technological capabilities (CSIR 2018). The key subjects that the CSIR pursues to engage via numerous interferences comprise: generating a vivacious economy and employment prospects; structure an accomplished state that is willing to steadily convey first-class services for all South Africans; and subsidise the improvement of socio-economic infrastructure like energy, transport, water resources and information communication technology (ICT) networks (CSIR 2018).

The CSIR houses a huge number of records due to the rising number of research projects that are driven by economic development and the social infrastructure developments that are taking place in South Africa (Matroko, Mniki & Van Deventer 2007). Besides, many records are usually transferred from different organisations such as the Department of Science and Technology and Armscor in South Africa to the CSIR just because of the strategic position of the Council in the country. Currently, there are many records deposited at CSIR to support the researchers in South Africa (Matroko et al. 2007). For reliable access and permanent storage of records, the CSIR manages its records both manually and electronically to ensure that researchers always have access to records (Van Deventer 2011). Numerous efforts have been made to ensure that records are managed by various devices for their permanency and for the advantage of researchers who need effective and efficient access to scientifically managed records. Despite the efforts made to manage these records, the researcher observed that the records are still not being managed efficiently and effectively at the CSIR. The researcher's assumption is based on the challenges such as system overloading and crashing, records duplication, records captured in the system but not on the shelves and records sent to unintended recipients confronted by the CSIR in terms of their records management services. This study, therefore, investigates the utilisation of AIT for the management of records at the CSIR for effective and efficient records management services.

1.2 PROBLEM STATEMENT

AIT can contribute to the efficient and effective management of records as it automatically scans, classifies, saves, digitises, and makes records retrievable effectively and efficiently for the benefit of users (Ripcord Company 2019; Demaitre 2020). In the United States of America, the application of AIT in the provision of effective and efficient records management services has meaningfully and successfully contributed to the realisation of institutional goals (Ripcord Company 2019). However, little is known about how this technology can be harnessed to manage records effectively and efficiently in cases where records are not effectively and efficiently managed in South Africa (Van Deventer 2011; Patterton 2017; EE Publishers 2017; Modiba et al. 2019), and the CSIR is no exclusion here. This is so because scholars such as Ngoepe (2014); Bouwman (2015); Marutha (2016); Luthuli and Kalusopa (2017) and Modiba et al. (2019) lament of poor records management in the public sector in South Africa.

The problem that led to this study was that the CSIR is unable to manage its records effectively and efficiently because of the problems encountered with its records management systems such as records duplication, intermittent system overloading and crashing, and records that are wrongly sent to unintended recipients (Matroko et al. 2007; Van Deventer 2011; Patterton 2017; EE Publishers 2017). The researcher's anecdotal evidence suggests that the CSIR experienced a rapid increase in their number of users, resulting in a computer server that is used to store records receive full and new records, but these could not be added due to obsolete technology (Van Deventer 2011; Patterton 2017; EE Publishers 2017). Even though the CSIR records management division is doing its best to address this, this problem persists, especially when new researchers join them and when more records are created. The researcher further learnt through preliminary study that the CSIR produces and receives a huge number of records despite the organisation having insufficient staff to manage them. As a result, the CSIR encountered a backlog in terms of records classification and filling of records in its storage facilities.

Furthermore, Bouwman (2015), Luthuli and Kalusopa (2017); Marutha (2016) underscore that in numerous institutions in South Africa, EDRMS can indicate the

location of a particular record on the shelves but when trying to find the record, it is not available (or vice versa) because some records that are on the shelves might not be captured on the EDRMS. The same happens at the CSIR. As a result, such problems negatively affect the research productivity, innovations and technological advancement that may continuously cost the CSIR in terms of its inability to contribute to the global knowledge dispensation. An ineffective and inefficient records management system would deprive the CSIR of the opportunity to leverage its innovations and technological advancement and might also have a negative impact on the economy of the country (Van der Waag-Cowling 2003; Patterton 2017). Once the CSIR begins to contribute minimally to research and knowledge production globally, the countries with financial muscles would also invest less in the economy of the country (Van der Waag-Cowling 2003). Hence, the CSIR should invest in technological resources such as AIT to ensure that the research and innovation responsibility of the CSIR is supported. AIT is capable of resolving challenges faced by the CSIR's traditional records management systems such as system overload and crash. AIT also provides reliable and sufficient storage capacity through cloud computing storage, records will be retrieved instantly through AI-empowered databases and records and will be secured through encrypted security passwords for reliable protection and privacy. Paper-based records will be digitised easily and quickly through embedded robotic machines. In order to achieve that, this study intended to investigate the utilisation of AIT for the management of records at the CSIR.

1.3   PURPOSE OF THE STUDY

The purpose of this study was to investigate the utilisation of AIT for the management of records at the CSIR in South Africa.

1.3.1 Objectives of the study

Riyami (2008) defines research objectives as a specification of the ultimate reasons for carrying out research in the first place and opines that research objectives result from the purpose of the study. Researchers prepare what is to be attained in a research study in certain terms and these research objectives are vital in any research as they

regulate the types of questions and measures to be utilised in data collection and analysis (Creswell & Creswell 2018). The researcher articulated the following objectives with the purpose of completing the above rationale of the study:

- To establish the current state of records management at the CSIR in South Africa.
- To evaluate the policy and legal framework for the management of records through AIT at the CSIR in South Africa.
- To identify the AI infrastructure readiness for the management of records at the CSIR in South Africa.
- To examine the usability of AIT for the management of records at the CSIR in South Africa.
- To determine the records management activities that can be carried out through AIT at the CSIR in South Africa.
- To examine the perception of records management practitioners regarding the usage of AIT for managing records at the CSIR in South Africa.
- To propose a framework to apply AIT for the management of records at the CSIR in South Africa.

1.3.2 Questions of the study

The following questions of the study were formulated in line with the objectives of the study:

- What is the state of records management at the CSIR in South Africa?
- How have the policy and legal framework been used to guide the utilisation of AIT for records management at the CSIR in South Africa?
- Why is the AI infrastructure required for the management of records at the CSIR in South Africa?
- How can AIT be used for records management at the CSIR in South Africa?
- Which records management activities could be carried out through AIT at the CSIR in South Africa?
- What are the perceptions of the records management practitioners regarding the utilisation of AIT for records management at the CSIR in South Africa?

- What kind of framework may be proposed to apply AIT for the management of records at the CSIR in South Africa?

Research dashboard

According to Damyanov and Tsankove (2019), a dashboard is a visual exhibition of the most important information needed to achieve one or more objectives; collective and arranged on a single screen so that the information can be scrutinised at a glimpse. In this study, the research dashboard is a table outlining the objectives, research questions, theories, methodologies and data collection methods of a study (it can also be regarded as a table of the research methodology). Appendix 10 is the research dashboard of this current study on the utilisation of AIT for the management of records at the CSIR (see Appendix 10).

1.4   JUSTIFICATION FOR THE STUDY

In this section, the researcher provides a justification of the expected influence of the research project in the development of scientific literature and research in the area of the study, business or functional practice and legal guidelines (Creswell & Creswell 2018). It is hoped that the CSIR will gain much from the outcomes and recommendations of this study, if implemented and applied accurately; and records would be managed and retrieved efficiently and effectively.

If properly implemented, AIT is expected to digitise, auto-classify, provide maximum storage facility, dispose of records and effectively manage the records at the CSIR. If AIT is applied for the management of records at the CSIR, the availability of finance and human resources would be considered so that the execution would be faultless. The AIT could ensure that records do not go missing, there is no duplication of records, records are not sent to unintended audience, the problem of system overload and crash does not occur, and records are digitised swiftly and effectively (EE Publishers 2017).

The outcomes of this study may be useful to the CSIR because the utilisation of AIT for the management of records would ensure that records are robotically classified and digitised, robotically stored in the cloud, effortlessly retrieved via a database connected to the robotic machine and electronically disposed of by means of a robotic machine. The utilisation of AIT would ensure that the CSIR and other organisations provide quality records management services. The results of this study would also add value to the body of knowledge in the field of archives and records management. The outcomes of this study would assist the policymakers at the CSIR and related organisations to formulate and implement policies that infuse the utilisation and in their application of AIT for records management.

The library and information science (LIS) schools in South Africa should also consider incorporating the application of AIT for the provision and management of information services in the LIS curriculum; this includes archives and records management. This study would recommend a framework of how AIT could be used to manage records. Other researchers in the field of AIT and records management would rely on and utilise the proposed framework to align critical aspects (title, theoretical/conceptual framework and objectives) of their future research projects. Since, this is a multidisciplinary study that brings together records management, AI, computer science and engineering, a mixed method research was recommended to successfully complete the study. Therefore, researchers in this field would adopt mixed methods research when researching topics related to AI and records management. Although the study is focused on the CSIR, all other related organisations may benefit from the results and recommendations of this study.

1.5   ORIGINALITY OF THE STUDY

According to Bhattacharjee (2012) and Edwards (2014), the originality of a study could be confirmed by means of establishing new approaches, methods, fresh areas of research, new clarification and solicitation of prevailing resources, and new solicitations of the present literature to the "new balance of ideas". The originality of the study should be based on the capability to generate and add to existing intellectual research property and fresh literature in the area of study, and the enhancement of practice and policies in the area of study (Jayasundara 2009).

Williams, Jones, Jonsson, Harris and Mulvany (2019) emphasise that a PhD study or thesis must contribute extensively to the prevailing knowledge in the subject field of the study. The study must be able to confirm that it is new by means of providing and producing new knowledge and practice of independent academic influence in a field of study. The thesis should also show that it is going to contribute in the subject field. This study is distinctive, and investigations were done by following a distinctive approach, methods and design using a distinctive population when associated with recent studies. This could result in the construction of the much-needed exceptional outcomes in the subject field of the study.

Other studies have been conducted in the area of digital archives and records management. However, the researcher's investigation revealed no evidence that the study about the "Utilising AIT for the management of records at the Council for Scientific and Industrial Research in South Africa" had been conducted before and achieved with empirical results. Empirical studies and scholarly articles that were conducted only pertain to the application of AIT in the provision of the library services in China (Yao et al. 2015; Cox et al. 2019). Yao et al. (2015) and Cox et al. (2019) published papers titled, "Smart talking robot Xiaotu: participatory library service based on AI" and "The intelligent library: through leader's opinions on the probable impact of AI on academic libraries", respectively.

However, nothing was revealed on archives and records management, apart from the blogs, opinions and conceptual papers by international records management practitioners on the significance of AIT in the management of records (Jackson 2011; Keily & Hamm 2013; Rolan, Humphries, Jeffrey, Samaras, Antsoupova & Stuart 2019; Modiba et al. 2019; Mullon 2019; Demaitre 2020; Tella, Olaniyi & Dunmade 2021). This study plays a vital role in the field of digital archives and records management because the study developed (to infuse AIT for records management) a framework for how AIT could be applied and utilised in organisations to manage their records via AI and robotic machines. Apart from the fact that AI is an innovation in the field of records management, the utilisation of AIT would ensure that records are effectively digitised, stored in a cloud storage facility, and retrieved and accessed quicker than when managed through historic methods of records management.

1.6   SCOPE OF THE STUDY

The scope of the study helps the reader to define the diversity of the research and framework of the study parameters. As also indicated to by Akanle, Ademuson and Shittu (2020), the scope of the study brings forth the conceptual framework and research strategy. This research was conducted at the CSIR records management division, as it consists of business and research records. Business records refer to their finances, human resources and general records concerning the daily functions of the CSIR. Research records refer to the research work that the CSIR engages in through their researchers in the national and universal context. Furthermore, the CSIR has branches across the country and on the rest of the continent (Van der Waag-Cowling 2003). However, this study focused at the CSIR headquarters in Pretoria because records are only deposited and managed from the headquarters. The researcher covered the research records of the CSIR because the management of such records contributes holistically to how the CSIR participates in the global dispensation against their peers in the research and technological innovation fraternity. Even though the CSIR's business records are equally important in the holistic growth of the organisation, this study only focused on the research records of the institution (Matroko et al. 2007; Elg-Vinnova 2014; Manzini 2015).

1.7   DEFINITIONS OF KEY WORDS

In this section, the researcher defines and explains the denotation of the main terms utilised in the study. This would give the reader the best comprehension of the information to be unpacked in the content.

1.7.1 Artificial intelligence

Weckerk and McDonald (2007); West (2015); Kalaiselvan et al. (2021); Marcu and Marcu (2021) define AI as a margin of computer science that focuses on the construction of intelligent machineries that function like HI. Muler and Nick (2016) and EE Publishers (2017) define AI as elements of various technologies that can be joined in various ways to understand, comprehend, act and learn (this refers to big data joined

with cloud connectivity and the internet of things). Iron Mountain (2019b) refers to AI as the process of working with robotic machines to do the jobs better, produce greater competences and drive economic evolution. In this study, AI refers to a programmed robotic machines and AI-powered computer programs that are capable of automatically carrying out a difficult sequence of activities in the area of archives and records management (Iron Mountain 2019a). Singh (2008) and Techopedia (2018) further indicate that all AI-powered technological systems encompass four constituents, namely: representation, problem-solving methods, architecture and knowledge.

According to Wang and Siau (2019); Kalaiselvan et al. (2021), AI is a general term that has an impact on and is impacted by numerous disciplines, such as engineering, computer science, mathematics, biology, logic, psychology, business, statistics, philosophy and linguistics. The computer must have an internal means to represent the task; for example, emblematic depiction of the situation for a mobile robotic machine or a set of symptoms concerning the individual sickness for a diagnostic programme. In the context of this study, the term AIT refers to a robotic machine that has the capability for automated digitisation, automated classification, and records storage and retrieval (Ripcord Company 2019). Reddy, Fox and Purohit (2019), and Marcu and Marcu (2021) define AI as the engineering and science of creating intelligent machines. For machine to be labelled 'intelligent', it would have to illustrate behaviour different from that of a human. With the advent of AI and its capability to imitate elements of HI such as decision making and reasoning, language and vision, knowledge representation, communication and complex task processing, it would be easy for robotic machines to manage records effectively and efficiently (Wang & Saui 2019).

1.7.2 Robotics

Robotics is an interdisciplinary research area resorting under the collaboration of computer science and engineering (Vichitkraivin & Naenna 2021). Robotics encompasses the design, construction, operation and use of robots. The purpose of robotics is to develop and invent intelligent machines that could help humans in their day-to-day endeavours and ensure that everyone is protected (Perez, Deligianni, Ravi

& Yang 2017). Robotics develops and design machines that could replace humans and duplicate human activities (Kalaiselvan et al. 2021). Robots could be used in numerous situations and for several determinations, but today, many are used in hazardous situations (including examination of radioactive materials, bomb detection and deactivation). They are also used in industrial procedures, or where humans cannot endure (in high heat, under water, in space, and clean up and suppression of dangerous resources and radiation). Robotic machines can take on any form, but some are created to imitate humans in appearance (Perez et al. 2017).

Robotics could also be adopted in disciplines such as economics, accounting, library and information, and in archives and records management. From a societal perception, robotic machines are frequently observed as the palpable personification of AI, because, unlike most traditional AI systems, robotic machines are physical and interrelate with their circumstances (LeCun, Bengio & Hinton 2015). In the field of library and information science, robots such as Xiaotu and Libby are used to provide the library services in libraries (Yao et al. 2015; Mathibela 2019). In the records management industry, Ripcord robot is used to digitise, store, retrieve and dispose of the records (Ripcord Company 2019).

1.7.3 Record

The term "record" is described in various ways from various perceptions, but it connects to a similar connotation as that confirmed by Yusuf and Chell (2005). Yusuf and Chell (2005) further explain that individuals from various circumstances or schools of thought habitually tend to complicate the gist of the term "record" with concepts like "data", "information", "knowledge" and "document". For example, some individuals explain it in terms of its physical form, and some explain it based on its possible future uses. Records are described by ISO I5489-1 (2001a) as information created, received and preserved as evidence and information by an institution or individual, in fulfilment of legal responsibilities or in the transaction of business.

Mampe and Kalusopa (2012) explain it as "information packaged in any method produced, received and preserved by an institution as evidence of its daily business". It can also be explained as a transaction conserved to be used as evidence in future

due to the format of the information it encloses. According to Chinyemba and Ngulube (2005), a "record" is documented evidence that an institution generates, receives and preserves in various formats and mediums, and ultimately uses in clearing their legal directives and/or following business dealings that deliver information as evidence.

1.7.4 Records management

Records management refers to a group of functions essential for scientifically regulating the creation, circulation, usage, conservation and disposition of recorded information preserved as evidence for commercial functions and dealings (Adu 2014). Records management is the arena of management accountable for the competent and methodical control of the creation, reception, preservation, usage and disposition of records, comprising the procedures for apprehending and preserving evidence of and information concerning the commercial functions and transactions in the method of records. Records management is also determined to observe with functional commercial needs, legislative and monetary requirements, and user's prospects (Palmer 2000; ISO 15489-1 2001b).

The aim of records management is to assist an organisation to preserve the essential documentation retrievable for both commercial operations and compliance audits. In small to mid-sized organisations, a spreadsheet is used to trace where records are stored, but larger organisations may find records management software sets that are linked to both taxonomy and records retention schedules to be extremely useful. Such software suites may be advertised as enterprise information management (EIM) functionalities that are able to assist an organisation to manage both records and normal content (Palmer 2000; Adu 2014). Records management is an area of management accountable for the effectual and methodical control of the creation, reception, conservation, use and disposition of records, including procedures for apprehending and preserving evidence of and information about business functions and transaction in the form of records (Yuba 2013).

1.8   CONCEPTUAL FRAMEWORK

Conceptual framework is an outline that consists of concepts that give the research a direction in data collection and analysis. A conceptual framework connects concepts from numerous philosophies, from preceding research outcomes, or from the researcher's own experience (Nieswiadomy 2012; Ravitch & Riggan 2017; Ngulube 2020b; Van der Waldt 2020). Miles, Huberman and Saldana (2014) describe conceptual framework as a "visual or textual illustration of the connections between the perceptions, variables and/or expectations upon which the research is based". Based on the literature review, the researcher established a conceptual framework that supports the utilisation of AIT in the management of records at the CSIR. From the literature review, the researcher found critical concepts that could be used towards the development of an AIT framework for the management of records at the CSIR. These concepts include records management policy and legal framework, records life cycle, records continuum, AI, Technology Acceptance Theory (TAM) and Object Analysis for Embedded System Theory (OAES).

1.9   RESEARCH METHODOLOGY

A research methodology aims to "assist the researchers to comprehend in the widest probable terms, not the products of systematic investigation but the procedure itself" (Nayak & Sigh 2015). It incorporates conceptual frameworks, tactics adopted, the study design, data collection methods and tools. In this research project, the methodology consists of the following components: research paradigm, research method, research design, population, sampling procedures, data collection, data analysis, reliability and validity of the study. The researcher in this study opted for pluralism ontology and pragmatism epistemological perspectives.

Mixed methods research with a convergent design was employed in this study. The researcher also opted for a parallel sampling method to conduct this study. In total, eight individuals were the population of the study. This includes one portfolio manager, one records manager, three professional repositories and indexers, two archives technicians and one data librarian. Data was collected using focus groups, a questionnaire, interviews, document analysis and observation. System analysis was

used as a lens to review the current records management system and a comprehensive description of research methodology is illustrated and discussed in chapter 3 of this thesis.

1.10   OUTLINE OF CHAPTERS

This section describes how the chapters of the research report or dissertation are organised. It also explains what is discussed in each chapter. In this research, the report was presented in six chapters as delineated below:

Chapter 1: Introduction to the study

This chapter elaborates on the overview of the project, the research problem, the research rationale, the research objectives, the research dashboard, the justification for the study, the originality of the study, the definition of key terms, the summary of research methodology, the framework of chapters and the timeline.

Chapter 2: Artificial intelligence technology for management of records

This chapter discusses literature relating to the utilisation of AIT for the management of records. It also discusses the conceptual framework related to the utilisation of AIT for records management.

Chapter 3: Research methodology and design

This chapter discusses the research methodology for the study covering research paradigms, design and population of the study, sampling methods, data collection methods, data analysis and ethical consideration of the study.

Chapter 4: Presentation of the findings

The researcher presents the outcomes of the research in this chapter.

Chapter 5: Interpretation and discussion of the research findings

In this chapter, the researcher interprets the outcomes of the study.

Chapter 6: Summary, conclusions and recommendations of the study

In this chapter, the researcher summarises, concludes and makes recommendations based on findings of the study.

1.11   SUMMARY OF THE CHAPTER

This chapter introduced the study and raised matters concerning to the application of AIT for the management of records. The conceptual framework, research problem, research purpose and objectives were discussed, and a case was made for the necessity to conduct this study. Important concepts were explained before illustrating the research methodology of the study. The next chapter provides the literature review for the study. The chapter addresses the following themes as formulated from the objectives of the study: state of records management at the CSIR, legislative and policy framework used for records management, the AI infrastructure that can be used to manage records, user perception of the application of AIT and records management activities that can be managed through AIT.

CHAPTER TWO

ARTIFICIAL INTELLIGENCE TECHNOLOGY FOR MANAGEMENT OF RECORDS

2.1   INTRODUCTION

Chapter One introduced the reader to the research and provided the context of the study. This chapter reviews the literature regarding the application of AIT for the management of records. A literature review is an analysis and description of information discovered in the literature associated with a research topic (Arlene 2014). The literature should designate, summarise, assess and elucidate the literature based on the research. It should give a theoretic foundation for the study and assist the researcher to control the nature of the research. Works that are irrelevant should be excluded and those that are marginal should be assessed critically (Arlene 2014). Creswell (2014) articulates that the literature review plays a significant role in the empirical study for the research outcomes.

The literature review provides a platform for researchers to benchmark with other, interrelated research to determine whether the study is important enough to conduct or not. In most cases, literature is reviewed from general to specific regarding the research problem (Creswell & Creswell 2018). The literature review in this chapter covered the current state of records management, AI infrastructure that can be used to manage records, usability of AIT for the management of records, records management activities that be carried out through AIT and user perception with regard to the application of AIT for records management.

2.2   THE PURPOSE AND THE ROLE OF THE LITERATURE REVIEW

Literature analysis plays an integral role in the scientific study for research outcomes (Randolph 2009; Pare & Kitsiou 2017). The literature review helps the research topic with the information about the research topic that have been conducted and the outcomes discovered relating to the present study (Pare, Trudel, Jaana & Kitsiou 2015). Literature refers to scholarly articles, books and other publications pertinent to any subject, the range of the study or theory, and by so doing, it gives an explanation,

a summary and perilous analysis of these works with regard to the research problem being investigated (Rowe 2014). The literature review was planned to give an outline of sources the researcher explored while researching a particular phenomenon and to illustrate to the readers how the research fits in with a bigger area of the study (Arlene 2014).

A literature review may encompass a summary of main sources, but in the social sciences, a literature review typically has an institutional pattern and connects both summary and synthesis, frequently within a particular theoretical class (Pare & Kitsiou 2017). A summary is an outline of the significant information of the source, but a synthesis is a re-organisation of the information in a way that enlightens how the researcher plans to investigate a research problem (Rowe 2014). According to Budgen and Breton (2006), the characteristics of a literature review include the following:

- It provides a new clarification of ancient material or a mix of new and ancient clarifications.
- It traces the logical development of the field, including critical discussions
- It assesses the sources and guide the reader on the utmost relevant research
- It recognises where gaps exist in the way in which a problem has been investigated to date.

Templier and Pare (2015) underscore that the purpose of a literature review is to:
- put each work into the context of its influence to understand the research problem investigated
- designate to others the connection of every source that is under discussion to others
- classify new approaches to interpret prior research
- divulge any loopholes that are in the literature
- solve conflicts among inconsistent previous research
- recognise areas of prior studentship to avoid duplication of effort
- identify the way in which to satisfy a need for further research
- trace your research within the context of prevailing literature.

2.2.1 Literature review procedure and sources

Literature is reviewed from "research and also empirical papers or opinions pieces that provide framework for thinking about a particular concept" (Creswell 2014). According to Creswell (2014), there is no average way to perform the literature review, but researchers regularly perform a literature review by methodically apprehending, assessing and summarising the literature. There are four steps to be considered when reviewing literature, namely:

- Step 1: Explore the prevailing literature in your research area of interest
- Step 2: Evaluate the literature attained
- Step 3: Establish a theoretical or conceptual framework
- Step 4: Start writing up the literature evaluation

Step 1: Search the existing literature in your research area of interest

The moment the researcher chooses the subject of their interest, they ensure it is well-studied area which could provide them with more background of research to choose from (Mats & Sandberg 2013; Templier & Pare 2015). The researchers narrow their subjects so that they can be inclusive and in depth because comprehensiveness and slightness of a subject are interchangeable. The researcher can now continue to search the prevailing literature. To effectually search for literature, one should keep in mind to have ideas of the area and the challenge the researcher wishes to explore. The primary mission would be to compile a bibliography in their study area (Arlene 2014). Books and journals are constantly the greatest literature sources in any research area. The finding of the research could be sourced out to numerous pertinent sources and they would save the researcher much time. The sources embrace the following:

- Indices of journals
- Abstracts of articles
- Citation indices

In many libraries, books, journals and dissertations are housed in computer systems and on CD-ROMs. The electronic library could assist the researchers to prepare a bibliography and evaluate the literature for their investigation (Mats & Sandberg 2013).

Step 2: Evaluation of the literature attained

When the researcher has identified numerous journals and books, the next task is to begin reading them attentively to put together collective themes that relate to the study (Arlene 2014). If the researcher does not identify a framework to start with the research, they should write down the major ideas they extracted from the journal articles and books. When the researcher creates a rough framework, the extracted information might be included properly (Darlow & Wen 2015).

Step 3: Develop a theoretical framework

Darlow and Wen (2015) opine that evaluating the literature can be an endless job. The researchers must be aware that with little time, they must complete their research project; therefore, it is imperative for them to put the boundaries by evaluating literature pertinent to their study. All information they gather from literature sources must be arranged properly with concepts and theories they include in their framework. Except for evaluating the literature concerning the framework that the researcher has established, they should establish their focus in their literature search. This means their theoretic framework will provide them with a foundation and guide to study continuously. The greatest activity would be to establish a framework first and later move into literature search (Pare & Kitsiou 2017).

Step 4: Writing up the literature evaluation

The last activity would be to compile and write all the literature the researcher has evaluated. The researcher should start their evaluation with some concepts that he wants to highlight and should arrange and put together concepts that would be discussed and narrated (Pare & Kitsiou 2017). While writing, the researcher should recognise and define several philosophies pertinent to the research area and identify holes in the body of the knowledge in that vicinity. The researchers must continue to elucidate current benefits around the investigation, as well as existing developments (Petersen, Vakkalanka & Kuzniarz 2015). It should be noted that in the field of the fourth industrial revolution and records management research, including the use of AIT for the management of records, current trends are always given great significance. Petersen et al. (2015) state that the researchers describe, contrast and assess outcomes based on:

- research assumption

- theories connected to the area of investigation

- hypotheses

- research design utilised

- concepts designated

- possible future functions speculated by researchers.

2.2.2 Referencing of sources

Smith, Devane, Begley and Clarke (2011); Arlene (2014) opine that scholarly writing depends on many philosophies and the involvement of a single writer. It also uses the philosophies and research of other sources, journals articles and websites. Sources may be used to substantiate the author's knowledge, or the author may discuss, analyse or further critique sources. Sources are acknowledged to inform the reader where philosophies and concepts from other sources are being utilised in a dissertation (Jill 2011). According to Arlene (2014), there are reasons why it is imperative to acknowledge sources properly, such as:

- it demonstrates to the reader that the researcher can discover and use sources to produce a compacted argument

- it correctly credits the initiators of concepts, philosophies and research outcomes

- it illustrates to the reader how the researcher's argument connects to the bigger picture.

Referencing is a recognised structure, which has guidelines and ethics to consider when arranging references, and students discover referencing quite threatening at first (Oates 2011). The reference list is a list of all the sources utilised and cited in a thesis or dissertation and is alphabetised in terms of the names of the writers. Every source in the reference list comprises detailed information concerning a source. This generally involves the writer's name, the publication year, the title and other bibliographic descriptions of the publications (Randolph 2009; Arlene 2014).

Acknowledgement of sources is an important portion of the literature evaluation, as numerous sources are referred to and acknowledged in the study. Acknowledgement of sources is about citing other sources that are utilised in the study discussion. When sources are not properly acknowledged it is called plagiarism, which could carry momentous academic consequences (Arlene 2014).

2.2.3 Map of research literature

A literature review map is the primary requirement for the scholar as he starts reviewing his literature for this study (Randolph 2009). It is a resource used to arrange topics for the literature related to the study that should be obtained by means of an internet search and library enquiries. This assists the researcher to understand the value of literature that should be evaluated and that would be added in the study for more literature in the area of the study (Creswell 2014). Items are mapped from the objectives of the study. The main themes in the literature review were formulated from objectives of the study which are informed by the problem of the study and the conceptual framework. Figure 2.1 illustrates the map of the literature review.
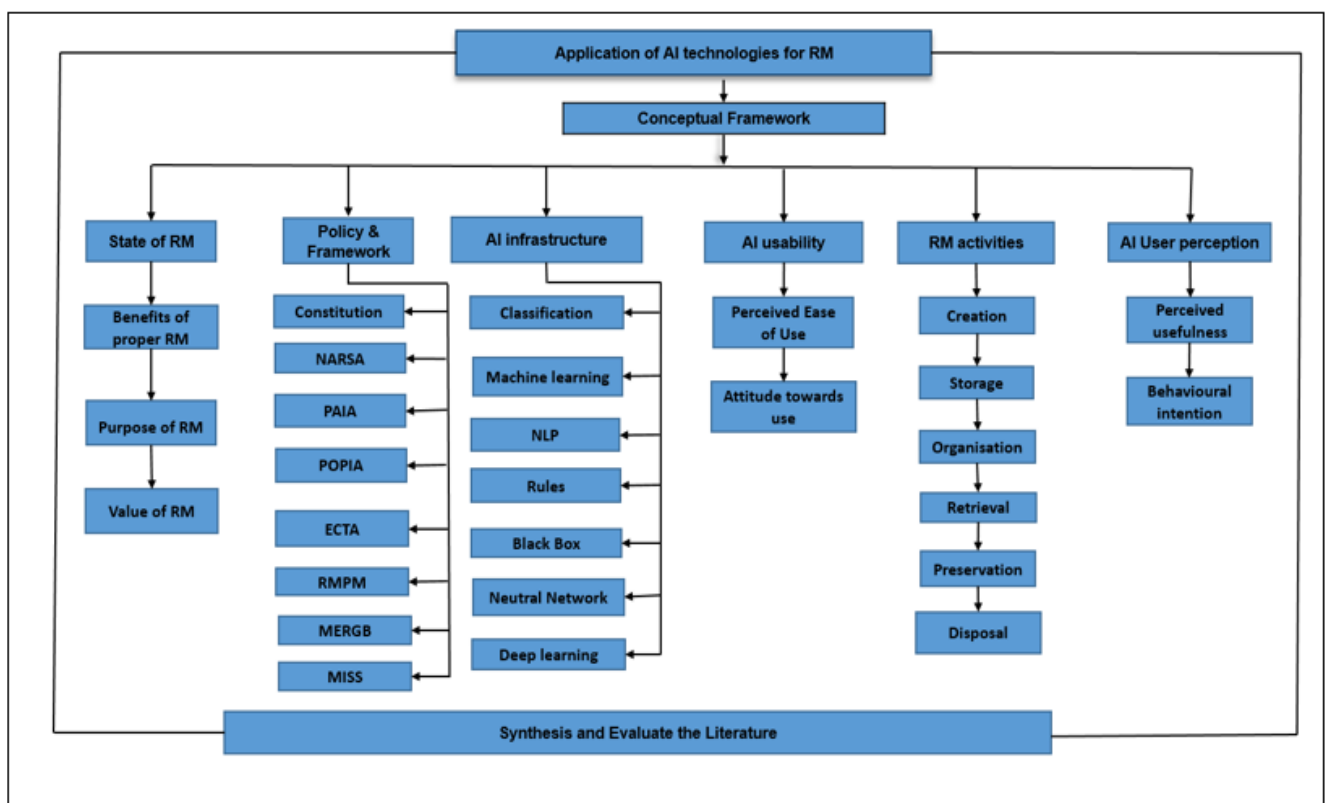
Figure 2.1: Map of the research literature (Researcher 2021)

2.3   CONCEPTUAL FRAMEWORK

Imenda (2014) and Van der Waldt (2020) explain that a conceptual framework involves several perceptions that enlighten a research project. These are generally illustrated diagrammatically to validate the connection between concepts. Conceptual framework is an outline that consists of concepts that give the research a direction in data collection and analysis. A conceptual framework connects concepts from numerous philosophies, from preceding research outcomes, or from the researcher's own experience (Nieswiadomy 2012; Ngulube 2020b). Miles, Huberman and Saldana (2014) describe conceptual framework as a "written or pictorial depiction of the relations between the perceptions, variables and/or expectations upon which the research is based". Based on the literature review, the researcher established a conceptual framework that supports the utilisation of AIT for the management of records. From the literature review, the researcher found critical concepts that can be used towards the development of AIT utilisation framework for the management of records in organisations. This conceptual framework is based on two major concepts, which are: AI (perception, usability, and system analysis) and records management (policy and legal framework; records management theories, such as records life cycle and records continuum; and records management activities). Figure 2.2 illustrates the interaction among these concepts to convey the utilisation of AIT for the management of records. Figure 2.2 also illustrates how the two concepts (AI and RM) can come together, as supported with other concepts to form a conceptual framework for the study.

The conceptual framework was established based on the concepts from the objectives of the study. The conceptual framework was based on the following concepts: records management, which includes records management theories (records life cycle, records continuum and records activities), and AI, which includes TAM (perception and usability) and OAES (system analysis and requirement analysis). The conceptual framework aligned the title, problem statement and objectives of the study. However, there was no a single theory that was suitable to be adopted in this study. Hence, the researcher had to adopt multiple theories to develop a conceptual framework for this study so that all the objectives would reflect in the conceptual framework.
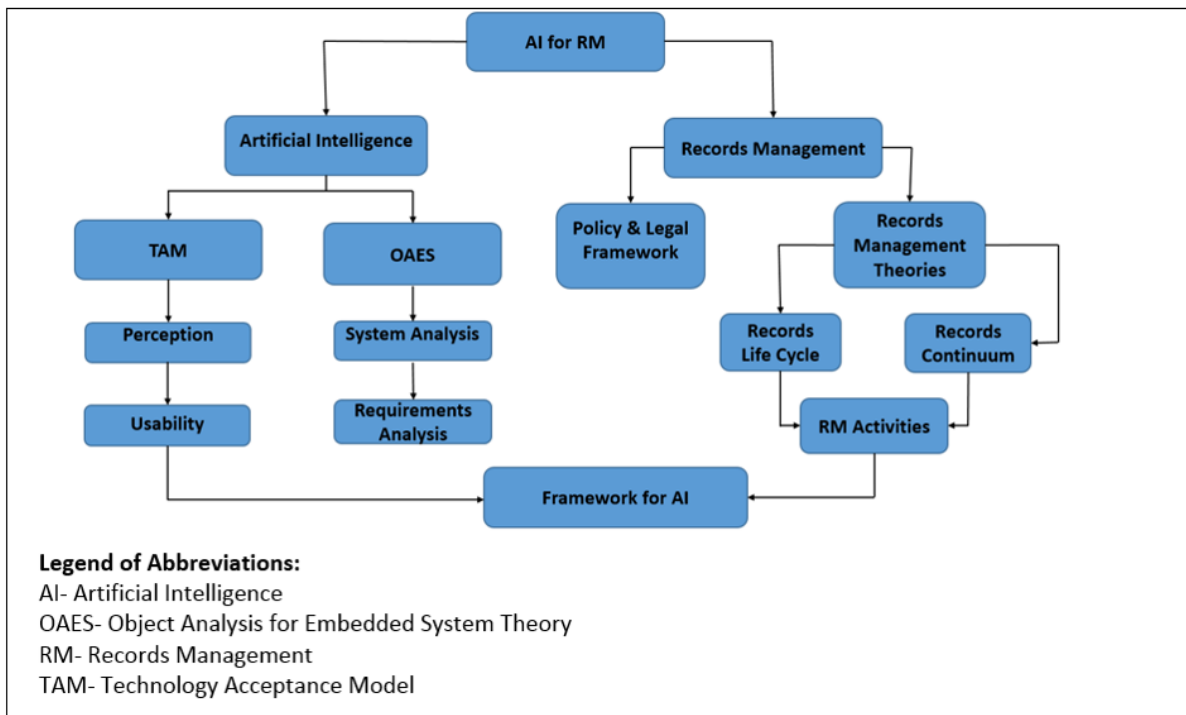
Figure 2.2: Conceptual Framework (Researcher 2021)

According to Miles et al. (2014); Ravitch and Riggan (2017); Ngulube (2020b) and Van der Waldt (2020), a conceptual framework is a researcher's map of concepts to be explored. It also offers a scope of the most significant concepts to be researched and what information should be collected and interpreted. The concepts informing the conceptual framework for this study were derived from the following theories: Technology Acceptance Theory (TAM), Object Analysis for Embedded System Theory (OAES), Artificial Intelligence (AI) Model, Records Life Cycle and Records Continuum. The objectives of this study were also derived from the conceptual framework of this study. TAM was developed by Fred Davis in 1986. TAM was instigated as an edition of the more generalised Theory of Reasoned Action (TRA) and was established more explicitly to envisage and explicate technology usage behaviour, and it was also established to recognise the aspects that lead to users' reception or refutation of a technology by integrating technological features into organisational behaviour perceptions (Davis 1989). TAM is the most convincing and universally accepted model to acknowledge the acceptance and utilisation of numerous technologies such as AI and robotics. The model has a solid theoretical foundation and enjoys adequate literature support (Lai 2017). When applied and utilised effectively, the model can save

organisations the risk of adopting and applying a technology that might continue to be unused (Gbongile, Xu & Amedjonekou 2017). Hence, it is important to consider some of the concepts from TAM in this study.

Konrad, Cheng and Campbell (2004) developed the OAES theory in 2004. OAES is a prevalent technological method for analysing and designing an application, system or business by object-orientated programming, and utilising modelling through the establishment of life cycles to foster improved shareholder communication and product excellence (Baniassad & Clarke 2004). The AI model combines more focused hardware and software with intricate databases and knowledge-based dispensation models to illustrate the characteristics of actual human decision-making. The concepts of the AI model include NLP, neural networks, expert system, learning system, vision system and robotics (Shubhendu & Vijay 2013). As such, AIT would be explored to determine if these theories could be adopted by the CSIR for the management of records. In this study, the researcher investigated the following themes as emanated from this conceptual framework.

2.3.1 Legislation and policy framework

Legislation and policy framework form a vital part in the management of records. It understands how legislation would assist in the effective and efficient utilisation of AIT for the management of records. Existing legislation governing the management of records in South Africa includes, but is not limited to, the Constitution of the Republic of South Africa, 1996 (Constitution); the National Archives and Records Service of South Africa Act, No. 43 of 1996 (NARSSA Act); the Promotion of Access to Information Act, No. 2 of 2000 (PAIA) and the Protection of Personal Information Act, No. 4 of 2013 (POPIA). Existing policies governing records in South Africa include the following: records management policy manual, managing electronic records in governmental bodies; such as policy, principles, requirements and minimum information security standards. In this study, the researcher aimed to determine which functions of records could be carried out through AIT so that those records could be accessed and managed effectively and efficiently.

2.3.2 Records management theories

The records life cycle and records continuum models are the most prevailing theories in the field of archives and records management (Chachage & Ngulube 2006). However, the following are the theories of records management (Millar 2009). *Respect-des fonds* is the initial theory, which encompasses the respect of the creator of a record. In this theory, there are two correlated perceptions which are provenance (office of origin should be known each time a record is created) and original order (the order and organisation in which records are created and stored by the office of origin).

The second theory is the records life cycle theory. The elementary perception of this theory is that a record progresses through three stages: the record is created, the record is utilised and preserved, and the record is disposed of. This could be likened to the life of a human being who is born, lives, dies and is resuscitated to everlasting life. According to Millar (2009), apart from the life cycle concept, massive amounts of inactive records congest office space, and it is impossible to access significant administrative, financial and legal records.

During the life cycle of a record, the record is created and goes into its current stage. During the current stage, records are used frequently for the conduct of the present business of an institution; these are also called active records and they are usually reserved in their place of origin (Chaterera 2013). From current, a record enters the semi-current stage where records are irregularly needed in the conduct of present business. Semi-current records are preserved in the records centre awaiting their final disposal (Biraud 2013). From the semi-current phase, records are chosen to be archived. Archives are records chosen for permanent preservation because of their permanent value and they are generally preserved in an archival repository. The life cycle concept has been beneficial in endorsing a sense of order and a methodical approach to the general management of recorded information (Ngulube 2007).

The last theory is the records continuum theory. This theory is continuous and articulates the role of management processes from the moment of the making of records through to the conservation and use of records as archives. Millar (2009) defines the continuum concept as a reliable and comprehensive method of records

management through the life of the records, from the establishment of record keeping systems through the creation and conservation of records, to their preservation and use as archives. Frank Upward, an Australian archival philosopher, articulated that the records continuum as a theory is based on four principles (Upward 2000; Millar 2009). Upward (2000) and Millar (2009) underscore the following as the principles of the records continuum theory:

- The concept of records embraces records of enduring value (archives) emphasising their usage for transactional, evidentiary and memory tenacities, and unifying processes of archiving.
- Another concept is the emphasis on records as rational, rather than physical objects, irrespective of whether they appear on paper or in electronic format.
- One more concept is the institutionalisation of record keeping. The occupation's role needs emphasis on the necessity to integrate record keeping into business and societal procedures and determinations.
- Archival science is the foundation for organised knowledge.

For the purpose of this study, the records life cycle and the records continuum are explored. These records management theories are central to this study because they inform the objectives of the study. The researcher used concepts from these theories to formulate the conceptual framework of this study. As such, these theories are central to this research, hence, they are explored in this study.

2.3.2.1 Records life cycle

The idea of the records life cycle was conceived in 1934 by Theodore Schellenberg of the National Archives of the United States of America to offer a recommendation on the management of records that are created by managers in various institutions (Shepherd & Yeo 2003). Penn and Pennix (2017) state that "the life-cycle concepts of a record is similar to the life of a biological organism". It is born (creation stage), it lives (preservation and living stage) and it dies (disposition stage) (Shepherd & Yeo 2003; Williams 2006). In the organisation, records are created, preserved, used and disposed of. Hence, it is important to have proper systems such as AIT to effectively

and efficiently manage the records throughout the stages of their life cycle. AIT has the capacity not to create but to maintain, store and dispose of the records.

The record life cycle framework is based on good governance and its impact on the proper management of records (Williams 2006; Marutha 2021). The records' life cycle stages deliberate how records are handled at every stage. These stages include functional activities during the creation, receipt, maintenance, use and disposal of records (Marutha 2021). According to Shepherd and Yeo (2003), there are three stages throughout the lifespan in the management of records, namely: (1) Records creation and acceptance (born and accepted). During this stage, records are created or received in the form of paper-based records, (2) Records use and maintenance (life), for instance, the records would quickly be retrieved through the application of AIT to enable the users to perform their daily activities and (3) Records disposal or transference to the archives repository (die). In this instance, records that are deemed to have historic value are transferred to the national archives for future reference, as illustrated in figure 2.3 below.
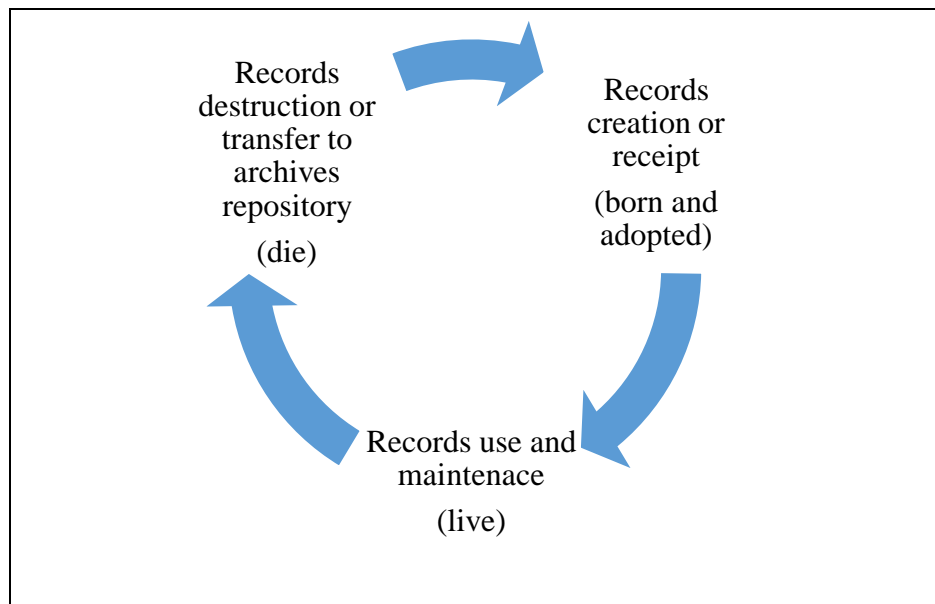
Figure 2.3: Life cycle of a record (IRMT 1999:19)

However, the records continuum theory has been introduced to directly handle both paper-based and electronic records (Flynn 2001; Upward 2000; Chachage & Ngulube 2006; Broglund & Oberg 2007). Tsabedze (2012); Chinyemba and Ngulube (2005) are

of the view that the proper management of records encompasses the establishment of methodical controls at each level of a record's life cycle, in accordance with developed values and putative models of records management.

2.3.2.2 Records continuum

In the 1990s, Ian Maclean took a step towards developing the continuum theory concerned with a continuum model that offers a constant and comprehensible continuum of records management processes from the time of creation and preservation of records to their final disposition (International Records Management Trust (IRMT) 1999; Flynn 2001; Marutha 2021). Upward (2000) points out that, "the continuum theory is explained in ways which display it as a time/space method rather than a life of the records method". According to Upward (2000) and Flynn (2001), the model provides a way to deal with issues pertaining to the collaboration of archivists and records managers, past, present and future in building partnerships with other stakeholders. In this instance, the responsibilities of archivists and records managers are mutual to safeguard the continuous survival of records from the beginning of the life cycle to the disposition stage. Upward (2000); Yusuf and Chell (2005) articulate that the theory is demonstrated in four phases, which are (1) Creation of records, in which the practitioners create records, (2) Capturing of records, when records are captured and stored in the ERMS, (3) Institution of corporate memory, which arranges for institutional memory and (4) Pluralisation of collective memory, in which organisational archives are pluralised with the aim of keeping communal memory as illustrated in figure 2.4.
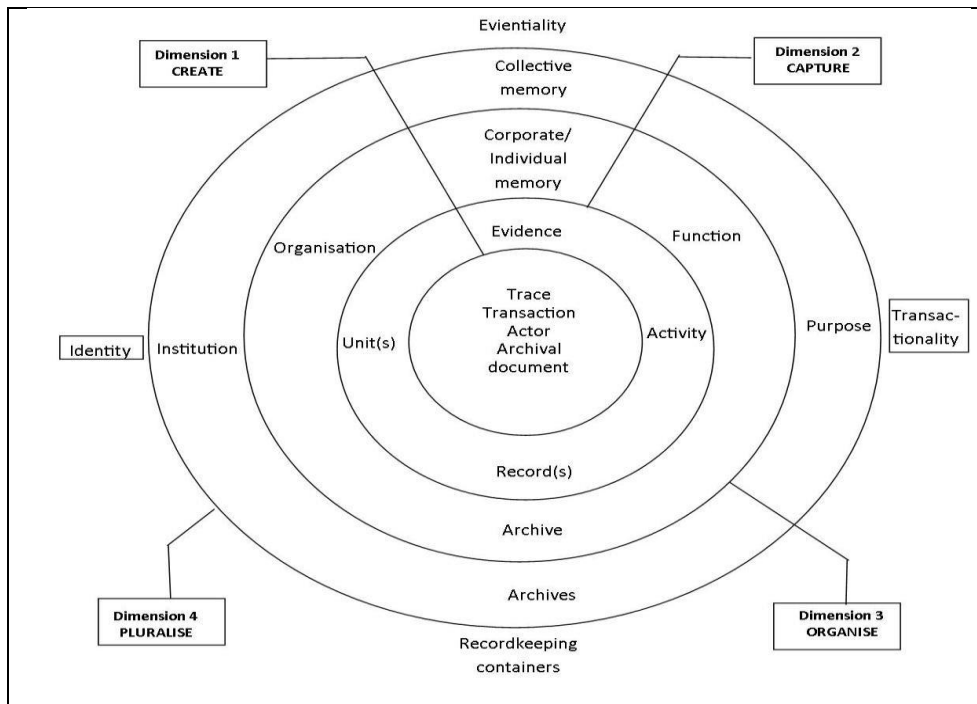
Figure 2.4: Records continuum model (Upward 2000)

2.3.3 Artificial intelligence

Artificial Intelligence (AI) means the use of robotic machines and software to digitise, manage and retrieve records effectively and efficiently (Kalaiselvan et al. 2021; Marcu & Marcu 2021). According to Bowser et al. (2017), the benefits of AI include the ability to solve glitches associated with human errors, prove the human conditions, provide efficient and effective service delivery and build capacity to resolve difficult challenges. In this study, AIT is required to resolve problems related to records lost, duplication, damage and misfiling. AIT would also ensure that records are accessible when required by users so that they are able to provide services that satisfy and maintain every organisational mandate.

Bostrom and Muller (2016) opine that fatigue can hinder with human capabilities in a way that could only be resolved by records automation through the utilisation of robotic machines. They further state that AIT could complement human capability where big data is involved by amassing, categorising and arranging information quicker and better than human capability alone. Hence, through the application of AIT for the management of records in companies in China and the United States of America, they

were able to resolve challenges related to poor records management (Yao et al. 2015; Ripcord Company 2019).

AIT application infuses a variety of work and functions and converges with other new and evolving technologies; hence, the benefits for the human capabilities could continue to grow through the utilisation of AIT for the management of records (Bowser et al. 2017). Modest workplace records automation connects to the effectiveness and an overall reduction of the amount of work needed for one to retrieve records. These benefits concurrently increase the advantage of work by transferring human skills for innovation rather than doing tedious records management activities (Bostrom & Muller 2016). For the purpose of this study, the researcher elaborates on the concepts of perception, usability and system analysis as central to the objectives of this study.

2.3.4 Technology Acceptance Model

Fred Davis developed TAM in 1986 in his doctoral study titled, "A technology acceptance model for theoretically testing the novel end-user information systems: theory and results". TAM is an information technology framework to comprehend users' utilisation of developing technologies, especially in the office environment, and has been tested in older population. The theory suggests that an individual's interest to utilise technology (technology acceptance) and their usage behaviour (actual usage) of a technology are predicted by the person's perception of a particular technology's usefulness (benefits from using technology) and ease of use (Ratten 2020; Knox, Gemine, Rees, Bowen, Groom, Taylor, Bond, Roser & Lewis 2021). For the purpose of this study, the researcher investigated the perception of the users based on perceived usefulness, perceived ease of use and attitude towards use.

2.3.4.1   Perception

Daddario (2007) describes perception as the procedure to attain cognisance or comprehensiveness of sensory information. The Collins Essential English Dictionary (2006) defines perception as: "1) Insight or intuition 2) Way of viewing". Perception also refers to the description comprising consciousness, knowledge, realisation, sense, perception, origin, impression and view. Other connected concepts are:

consideration, perception, observation, information, intellect, mental model and comprehensiveness (Pender, Murdaugh & Parsons 2002).

Perception is a person's understanding of something, which makes it an authoritative driving force for action. Processing sensory information and experience permits one to make an observation in which to investigate the universe through a view of sociocultural impact. Perception is not impartial. It is a person's exceptional way of observing a concept that includes the dispensation of stimuli and integrates memories and experiences in the process of comprehension (McDonald 2011).

One of the central parts of TAM is the acknowledged concept of perceived usefulness that plays a crucial role in acceptance behaviour. Perceived usefulness means the perception that users have about the use of a technological innovation, for instance, the utilisation of AIT for the management of records (Ratten 2020). This concept is derived from Technology Acceptance Theory and denotes the degree to which an individual believes that utilising a specific system would improve his/her job performance. Records management practitioners and the management team in the records management industry should be convinced that the utilisation of AIT would enhance their records management services (Davis 1989; Bugembe 2010).

Perceived ease-of-use is conceptualised as whether users view an innovation as comprehensible and reliable (Tong 2010). According to Ratten (2020), the capability to utilise the technological innovation is vital for users who are adopting the technology that progresses at a quicker rate, such as AIT. This concept also emanated from the TAM. It is the degree to which an individual believes that utilising a specific system would be free from effort. For instance, the records management practitioners should believe that it would be easy to use AIT and the robotic machine would fit well into managing their records and producing effective and efficient results (Ma, Gam & Banning 2017; Knox, et al. 2021).

Another concept derived from TAM, which is regarded as the third feature, is connected to attitude towards use (ATU). It is about the attitudes of users towards the utilisation of a technology as an imperative component in defining the reception of the technology. This implies that the records management practitioners should develop a

positive attitude towards using AIT for the provision of better records management services (Lai 2017).

2.3.4.2   Usability

The concept 'usability' was developed some decades ago to substitute the concept 'user friendly', which, by the early 1980s, had developed a multitude of unpleasantly unclear and subjective implications (Nielsen 2012; Karlsson 2016). Nevertheless, in the prevailing years, the term usability itself has become diminished as the concept was envisioned to succeed. Usability is defined as how easy it is for the user to use a product, which involves learnability and the suitability of the item. It would also determine the actual usability by a specific user for a specific duty in a specific setting (Karlsson 2016).

Usability is also defined as the ease of use and suitability of a system or product for a specific group of users carrying out functions in a particular situation, where ease of use distracts user performance and gratification. Acceptability examines whether the item is utilised (Harpur 2013; Knox et al. 2021). Ease of use regulates whether an item can be utilised, and acceptability checks whether it will be utilised and how it will be utilised. Ease of use in a specific setting is determined by the item qualities and is measured by user performance and satisfaction (Nielsen 2012). The concept of usability intends to examine whether the AIT would be usable for the management of records. To investigate this, the researcher also looked into the following concepts of OAES (system requirements, requirement analysis and system analysis).

2.3.5 Object Analysis Embedded System

Konrad et al. (2004) developed OAES in 2004. OAES is a prevalent technological approach for examining and designing an application or system by object-orientated programming, as well as utilising modelling through the development of life cycles to nurture improved stakeholder communication and product quality (Baniassad & Clarke 2004). The concepts of OAES are as follows: system analysis and requirements, behavioural object analysis and structural object analysis (Konrad et al. 2004).

However, this study would focus on system analysis and requirements since it focuses on the application of a new AIT system for the management of records.

2.3.5.1   System analysis and requirements

'System requirements' is a concept that derives from THE OAES theory. It indicates that system requirements are the requirements that a system must have based on the hardware or software application so that it would be able to run efficiently and proficiently (Vogel-Heuser, Fay, Schaefer & Tichy 2015). Failure to meet these requirements could result in connectivity and performance challenges. The latter could prevent a device or application from connecting, whereas it could also cause a device to break down, perform below anticipation or crash (Konrad et al. 2004). Therefore, it is important for the records management practitioners to ensure that they analyse the systems before using them for records management. This would assist them to detect the challenges and provide solutions before adopting the new system.

The other concept that also emerged from the OAES theory is requirement analysis. This is an examination phase which classifies the factors into functioning, hardware, software, regulatory, safety, security and upgrade requirements. Furthermore, matters such as correction capabilities, cost assessment, flexibility and development, software in-field upgradeability and acceptance testing are evaluated and conveyed to the users (Konrad et al. 2004). Based on the information gathered in the evaluation stage, additional requirements are announced and deliberated with the user. Contradictory requirements (such as the design of an ultra-safe system at a very low cost) are emphasised to the user and deliberated to ensure that the user is aware of the compromises (Wiegers & Beatty 2013). The researcher would investigate all the infrastructure required for the better management of records so that they would be able to adopt and apply AIT for the management of records.

System analysis is a concept that is also emerged from the OAES theory and has to do with the procedure to investigate a system, recognising problems and utilising the information to suggest improvements to the system or recommending a new system all together (Konrad et al. 2004). Systems analysis is the procedure used to observe systems for troubleshooting or improvement. It is implemented through information

technology, where computer-based systems need distinct examination according to their makeup and design (Rigat & Smith 2009). In this study, the researcher analysed the functions of the current records management system in order to find out what the challenges of the current records management system are before adopting a new one.

2.4   STATE OF RECORDS MANAGEMENT IN THE PUBLIC SECTOR

The state of records management refers to the current position of records and its management in the organisation and it indicates whether records are managed properly or not. There are benefits for organisations when their records are managed effectively (Tagbotor, Adzino & Agbanu 2015).

2.4.1   The benefit of effective records management in the public sector

Institutions that administrate their records effectively are rewarded with numerous benefits. These benefits comprise, but are not limited to, quicker access to records, capability to stop and track fraud and corruption, simple to follow knowledgeable decision-making and problem-solving, and the protection of institutions against legal claims (Marutha 2011). The institution is also able to fulfil all the pieces of legislation relating to professional administration and responsibility. Records can be used to support operational functions; decision-making and responsibility and good records management helps the institution to preserve well-organised records in their operation.

Properly organised records allow an institution to discover the right information simply and reasonably, and to achieve its functions effectively and proficiently and in a responsible manner. Well-organised records support the operational, legal and responsibility needs of the institution and certify the conduct of the organisation in an arranged, effectual and responsible manner (Chinyemba & Ngulube 2005). Records that are well organised ensure that there is reliable delivery of services because records are always available when needed (Huffer 2008). These records defend the interests of the institution and the rights of workers, users, and current and imminent stakeholders. Well-organised records also support and record the institution's functions, establishment and accomplishments. Such records give evidence of operations in the cultural setting and contribute to the social identity and collective

reminiscence of the country (National Archives and Records Service of South Africa 2006).

2.4.2 Easy retrieval and access

Thurston (2005) and Iwhiwhu (2005) emphasise that consistent, appropriate and available records give access to information concerning managerial functions, such as tools received, tools committed or spent that enable accountability and make it easy. Properly administrated records are filed in accordance with the institutional filing plan. When records are well managed, they are retrieved in minutes and not in hours. This is because records can be located by the file number in the filing system and then accessed from the filing shelves, since there would be no misfiling, especially if records are correctly administrated. A file plan is a tool for organising records. A file plan ensures that it is easy to store, retrieve and dispose of records and it could be used to manage both paper and electronic records (Nelson 2012). Properly managed e-records with no technical faults could be located easily on the e-records administration system by entering the file number, theme, keyword or any other essential information of the record as programmed and created by the system, on the keyboard and then retrieving the e-document (Marutha 2011). Thurston (2005) indicates that poor records management leads to records being stacked in various offices due to a lack of staff training, and a lack of infrastructure, polices and standards. Ngoepe (2004) emphasises that proper record keeping saves time because there is no struggle when retrieving information. Records modification and retrieval are simply traced by means of an audit trail and records are disposed of as per the pertinent legislative context, such as the NARSSA Act.

2.4.3 Administrative governance

Records are preserved for their administrative, historical and archival standards (Chachage & Ngulube 2006). The institution also requires standards to interrogate its acquiescence with policies and measures for better management of records. This standard should include the records management system audit to ensure that non-complying members are held responsible (Chinyemba & Ngulube 2005). "Comprehensive information and records management establishes compliance with

laws of the country" (Willis 2005). Records are key for the institution to effectively manage its business operations since it offers direction for decision-making and responsibility, and because records offer an institutional memory to rely on. The introduction and appropriate practice of good records management system would confirm maintainable and proper governance of the institution (Ngoepe 2004). Good records management makes administrative governance in the institution very easy because it is with the accessibility of records that assessment of the performance in various sections of the institution becomes simple and probable. It makes it simple for the management to recognise mistakes, bad performance, better performance and enhanced performance of the previous administrative function.

2.4.4 Prevention and tracking of fraud and corruption

An anticorruption determination is one of the performances presented to improve commercial activity, increase responsibility and reinforce civic society which relies on good records keeping. Fraud and exploitation can destroy the optimistic future of numerous institutions and deteriorate service delivery in most public institutions (Keorapetse & Keakopa 2012). One of the main resources in stopping and tracing fraud and corruption is good records management systems. If appropriately managed, records could be used to examine and verify fraud and corruption, and to perform evocative audits and evaluate institutional activities (Keakopa 2018). It is often with dependable, reliable and precise records that an institution can trace and charge an individual and hold them accountable for actions regarded as fraud and corruption. Nevertheless, without proper records, all evidence might be regarded as accusations which are challenging to prove. Bad records management opens the organisation up to the possibility of fraud and corruption (Thurston 2005; Bhana 2008). However, proper records management is essential to "uproot corruptions and misconducts from their origin" (Wamukoya & Mutula 2005).

2.4.5 Compliance with pieces of legislation

Records assist the institution with reliable and legal evidence for decisions and for the performance of administrative activities (Bhana 2008). "Good information and records management are required by various constitutional and communal law requirements"

(Willis 2005). Chachage and Ngulube (2006) claim that one of the main reasons for institutions to keep records which they produce during their daily institutional operations, is to fulfil the legal requirements and to defend the shareholders' democratic rights. Ngoepe (2004) indicates that proper record keeping was implemented by institutions through the drafting and passing of legislation such as PAIA and the Electronic Communications and Transactions Act, No. 25 of 2002 (ECTA). The CSIR would be able to provide records to the researchers within the prescripts of the law in South Africa.

2.4.6 Ensuring professional administration and accountability

The other main reason for managing records properly is to utilise them as "evidence of accountability and transparency for business operations to the shareholders" (Chachage & Ngulube 2006) because proper records management is significant and essential for any institution (Willis 2005; Wamukoya & Mutula 2005). Effective public service management is the end result of proper records management, because institutional management and decision-making rely heavily on the availability of records (Ngoepe 2004). Proper records management in all organisations would enable the users to do their work properly and timeously.

2.4.7 Purpose of records management

In many other institutional business tasks or work activities, records management is introduced for specific purposes. Among other purposes, it certifies accessibility of pertinent and timely information. Pertinent and timely information would always be accessible if records are managed appropriately (Carvalho 2001). Records management serves to advance compliance with legal and regulatory necessities and public developments. The development of knowledge sharing, knowledge retention and access to institutional memory would also be defined. Moreover, it would certify improved management of risks relating to the accessibility of evidence. The records would offer evidence of institutional activities and decisions implemented. Proper record keeping would also reduce storage, material and labour expenses (Carvalho 2001) because good records management comprises appraisal, retention and disposal, which ultimately eliminate bad and unused records that are no longer useful

to the institution. Removal would also lower the workload of records management practitioners. Moreover, Willis (2005) underscores that with a proper records management system, the institution would have the ability to fulfil the six key institutional necessities, which are as follows: transparency, responsibility, due process, managerial compliance, statutory and common law, as well as information security. Any institution's records management practices would comply with almost all these institution operational requirements, thus resulting in improved service delivery for that institution. Consequently, proper information and records management is established on a reputable records management framework.

2.4.8 Values of records management practice

Proper records management is always beneficial, both economically and administratively, to any institution (Kanzi 2010). Shepherd and Yeo (2003); and Kanzi (2010) underscore that the costs of valuable records management practices would increase effectiveness based on the outcome of the certain activities. Records of low quality would be identified, which could be instantly disposed of. This means that all records that are old and vandalised would be removed from the open shelves to be disposed of or placed in an archive. In discussion with the responsible division in any institution, the preparation of records preservation timetables for allocating material for perpetual preservation or destruction within a stated period would mean that the responsible committee would no longer have to make uninformed decisions about how to dispose of records (Huffer 2008). Proper classification and cataloguing of records would mean that documents needed by users could always be accessible quickly and easily and the creation of a secure, administrated semi-current records storage section would release office space. Proper recognition and cataloguing of semi-current records would again confirm effectual accessibility of records when they are requested. If necessary, the records manager could give guidance on the most suitable filing systems, file arrangements and retrieval systems, as well as guidance on electronic information management in accordance with the needs of the institution for long-term preservation of records (Kanzi 2010).

2.5 RECORDS MANAGEMENT POLICY AND LEGAL FRAMEWORK IN SOUTH AFRICA

Policy and legal framework do not include only the major element of the legislation itself, but also the administrative, political, organisational, social and economic circumstances or arrangement, which make the legislation available, accessible, enforceable and effective (Rundle 2009; National Policy Institute 2019). Legislative framework is the heart of the attainment of commercial goals in all corporate industries, including archives and records management (Marutha 2019). Any development in the management of records must be attained in overall cognizance that records are created in an institutional setting and based on a national legislative and regulatory framework (Katuu & Van der Walt 2016; Marutha 2019). Legislative framework has an incredible influence on how records, together with those that are generated and saved in networked environments, are managed in any country (Ngoepe & Saurombe 2016). Netshakhuma (2019) states that effective archives and records management is directed by a comprehensive legislative framework that explains records to evade uncertainty about the scope of the accountability at the national archives. Every records management division, either in a private and public institution, needs proper policy and legal framework to manage their records effectively and efficiently.

A policy and legal framework enable the records division to protect, administer and make their records available in a safe and professional way (Rundle 2009). A legal framework is also used by large organisations such as corporate organisations, educational institutions and government to notify workers about whose endorsement is required to create new policies, which legislation must be complied with hen developing new policies, how policies should be interconnected and imposed, and what high-level or long-term aims should new policies attempt to maintain (National Policy Institute 2019). A legal framework is virtuous only if it assists to achieve a certain objective: (1) where comprehensive legislation prevails on paper but the regulator is weak and infective and/or poorly resourced, (2) where the justice system is not robust and autonomous and (3) where legislation prevails but fewer, if any, of the key shareholders are aware of its prevalence or comprehend what it refers to (Rundle 2009). The National Archives and Records Service of South Africa (2006) indicates that the constitutional and regulatory outline and policy framework on which

comprehensive records management is anchored are the following: the Constitution and the NARSSA Act.

The statutory and regulation framework also includes PAIA, POPIA; and the ECTA. The policy and legal framework also comprise records management policy and managing electronic records in governmental bodies, which includes policy, principles and requirements, and minimum information security standards. This study also recognised the role that is played by the Constitution of the Republic of South Africa regarding the management of archives and records in South Africa. It is a constitutional right for records to be managed and retrieved by the South African public. All institutions, including the CSIR in South Africa manage and regulate their archives and records management services through the National Archives and Records Services of South Africa (NARSSA) policy guidelines and directives (section 13 of the NARSSA Act). NARSSA is an institution that gives guidance to records management practitioners in all public and private institutions in South Africa with guidelines to manage their records. The Constitution gave birth to all the policies and legal frameworks in the country and all legal frameworks are developed by the Constitution (NARSSA 1996).

2.5.1 Constitution of the Republic of South Africa

Chapter 2, section 32, sub-section 1 of the Constitution states that everybody has the right to retrieve information under the custody of the state and any information held by another individual and that is obligatory for the exercise or protection of any rights (Constitution of the Republic of South Africa 1996). The utilisation of AIT would ensure that individuals requesting information are provided with this information quicker and easier by using robotics to access it because AIT ensures that access to information occurs at a high speed. Requestors of information would also be able to perform their respective functions on time because of this speed of access (Tom, Keane, Blaze, Pasquale, Chiang, Lee & Lee 2020).

Section 5 of the Constitution deals with the operational parts of private regional legislative capabilities regarding the archives and records management. Part A of Schedule Five of the Constitution gives both the provincial and national archives the

mandate and responsibility to manage and preserve records. The Constitution mandates public archives repositories in South Africa to regulate records management in governmental bodies (national departments, provincial departments, municipalities and statutory bodies). This mandate emanates from Jenkinson's assertion that the primary role of the archivist or records manager is to manage the records, while the secondary role is to make records accessible to the users. This mandate charges public archives repositories with a statutory regulatory role concerning the management of records in governmental bodies, as well as preservation of records of enduring value to be used or retrieved by the public as a whole (Modiba et al. 2019). The constitution then gave birth to several pieces of legislation in South Africa that are authorised and accountable for the management and preservation of records in South Africa (Constitution of the Republic of South Africa 1996).

2.5.2 The National Archives and Records Services of South Africa Act

In terms of section 13(iii), it is the responsibility of the national archivist to assess the conditions subject to which electronic records are managed (NARSSA 1996). Therefore, in the application of AIT for records management, the national archivist would advise which records management activities would be managed through AIT. According to this act, an electronic records system refers to any records system in which information is created electronically and stored via of computer technology (NARSSA 1996).

Section 13 also addresses the administration and management of public records. It specifies that subject to the requirements of this NARSSA Act and charges the national archivist with the appropriate management and maintenance of public records under the care of governmental bodies (NARSSA 1996). For the application of AIT to be effectively adopted and applied to manage records, organisations must comply with the NARSSA Act to make sure that the management of records is suitable and effective. The application of AIT should be linked to and should not contravene the NARSSA Act to ensure that records are managed properly and effectively, hence this act has been reviewed in this study. The application of AIT could ensure that the CSIR complies with the act by making records accessible as quickly as possible, managing

records effectively, preserving records in the cloud storage and keeping records safe by ensuring that they are not destroyed, misplaced or lost.

2.5.3 Promotion of Access to Information Act

Section 29 of this act addresses issues related to access to and methods of access to electronic documents. If a requestor is given a notice of access, it becomes the responsibility of the information officer to locate the record and give it to the requestor (PAIA 2000). The information officer would use AIT such as robotics and connected software to locate and retrieve the requested information for the requestor. The requestor might also search for the information him-/herself in the records on the database that is linked to a robot and, when retrieved, the record would appear on the screen of the computer (Kruhse-Lehtonen & Hofmann 2020).

However, section 43 of this act deals with the obligatory protection of research information of the third party and the protection of research information of public institutions (PAIA 2000). The cloud storage in the organisation would be protected in such a way that no one without proper access to the records would be able to access them. Only the information officer would be able to grant access to records in their cloud storage. The records would be protected by encrypted security codes and passwords to ensure that the records are not accessed by anyone. AIT security systems would ensure that records are protected against illegal and unauthorised access (Tom et al. 2020).

2.5.4 Protection of Personal Information Act

Chapter 2, section 4, of this act is based on the lawful dispensation of personal information. The section indicates that when capturing personal information, the information officer should be responsible and accountable, and capture quality and reliable information, and safeguard the information processed (POPIA 2013). Robotic machines would be able to digitise as many records as possible. The robot would only digitise the information that is provided by the information officer. Therefore, it is the responsibility of the information officer to digitise the required information and take full

responsibility for the information they digitise through AIT because they are the ones feeding the robot with what it needs to be digitised (Demaitre 2020).

Section 5 of chapter 2 of the act also plays a crucial role and should be considered when adopting AIT for the management of records at the CSIR. This section describes that data subjects, meaning the person whose data is captured, has the right to have his or her personal information captured in accordance with the circumstances of the lawful capturing of personal information. His or her personal information should be lawfully gathered and processed. A data subject would not to have his or her personal information captured for the sake of straightforward marketing by means of an unsought automated communications act (POPIA 2013). The information officer digitising the records should ensure that he or she captures the correct information about other persons.

Section 24 of the act is about the correction of personal information and should also be considered during the implementation and utilisation of AIT for the management of records. A data subject may, in the arranged way, ask an accountable party to fix or remove personal data about a data subject in its custody or under a regulation that is imprecise, inappropriate, unnecessary, out of date, inadequate, deceptive or has been obtained illegally. This also includes abolishing or removing a record of personal information about the data subject that the accountable party is no longer permitted to withhold in terms of section 14 of POPIA (2013). The robotic machines to be adopted and utilised for the management of records should be able to correct information that was incorrect when it was automated. The AIT should be able to edit information captured so that it can autocorrect the information when requested (Davenport 2019).

2.5.5 Electronic Communication and Transaction Act

Chapter IV, section 27 addresses the acceptance of electronic filing and issuing of a document. The act states that any communal body that, pursuant to any law, accepts the filing of documents or has a need for records to be created and retained (ECTA 2002), could adopt the utilisation of AIT such as robotics, software and databases to ensure that records are filed electronically. Organisations would also use AIT to issue documents to the users as they request them.

Part 2, section 10 deals with the responsibility of the Minister to establish the electronic transactions policy (ECTA 2002). Public organisations should ensure that they establish and develop policies that would assist in the utilisation of the 4IR technologies such as AI, robotics, big data, blockchain, internet of things and web of things in the public sector (Manda & Dhaou 2019). Such policies on electronic transactions assist institutions such as the CSIR to swiftly manage their records through AIT.

2.5.6 Records management policy manual

Section 2.3 of the records management policy manual of the National Archives of South Africa dictates how institutions should manage their electronic records. Electronic records are subject to similar necessities offered in the NARSSA Act to implement to the management of other records (Records Management Policy Manual 2004). The manual states that the national archivist has the authority to determine the condition of records, whether they have been technologically replicated and the condition according to which the electronic records system must be managed. The national archivist would give guidance on the utilisation of AIT for the management of records in the public sector and on the records management functions that should be carried through AIT, such as classification or filing, retrieval, access to, disposal and preservation of records (Smith, Bayeck & Stewart 2020).

2.5.7 Managing electronic records in governmental bodies: policy, principles and requirements

The purpose of the policy on managing electronic records in governmental bodies: policy, principles and requirements is to offer direction to governmental bodies to help them to comply with legislative necessities concerning electronic records as a vital part of the strategic management of their records resources. Section 8.2.2 of this policy states that this policy addresses the information technology (IT) infrastructure that is needed to manage the electronic records in the public sector. The IT infrastructure refers to the development of an Integrated Document and Records Management System (IDRMS) that requires specific infrastructure specifications such as

inadequacies of the workstation, which need advancement before deployment; limitation of server stipulations; network boundaries which may impact reply times; elements that should be reutilised in the system and technology direction that was decided by the governmental body (Managing Electronic Records in Governmental Bodies: Policy, Principle and Requirements 2006). The IDRMS should be linked/connected to the applied AIT such as a robotic machine that would be used to manage electronic records effectively and efficiently in the public sector. When records are searched via IDRMS, they are retrieved by AIT (robotic machine) and accessed by the user via a database that is also integrated into the IDRMS and AIT. The robotic machine used to manage the records will also have the specifications such as auto-classification of records, auto-filing, cloud storage facility, and effective retrieval and access to records (Ripcord Company 2019; Demaitre 2020).

2.5.8 Minimum information security standards

According to chapter 4 of the policy on minimum information security standards, the security element of documents should be articulated, especially those that are classified as confidential, secret and top secret. During the classification process, documents need to be classified accordingly based on the sensitivity of the document. The degree of sensitivity governs the level of protection, which suggests that information must be granted or classified according to it (Minimum Information Security Standards (MISS) 1996). Such documents must not be easily accessible by the general public or unauthorised users. The information officer must put strict security measures in place for protection. Such documents must be protected by encrypted security passwords so that even when they are stored in the cloud, they would not be easily accessible with passwords. Only people with suitable security clearance or who, by way of exemption are allowed by the head of the organisation or section, would be granted access to such documents (MISS 1996) and they will punch in the correct password to access such documents. The utilisation of AIT will require strict security measures to keep secret documents protected. Robotic machines and cloud storage will require people to pass the security checks before being granted access to any records that are stored via the robotic machine (Montjoye, Farzanehfar, Hendrickx & Rocher 2017).

The previous section looked at the legislative framework to ensure that relevant and appropriate policies and legal framework are reviewed and taken into consideration when adopting AIT for the management of records. Since there is no policy and legislative framework to apply AIT to the management of records in South Africa, such policies should be formulated when AIT is applied to manage records in South Africa. This study used the existing records management policies and legislative framework to adopt AIT for the management of records. The researcher looked at what the Constitution of the Republic of South Africa says about the effective and proper management of records. The Constitution, therefore, gave birth to other legislative frameworks that play a vital role in public organisations for various functions, including electronic records management.

2.6 ARTIFICIAL INTELLIGENCE TECHNOLOGY INFRASTRUCTURE FOR THE MANAGEMENT OF RECORDS

Keily and Hamm (2013) explain that AIT is steadily penetrating the diverse aspects of human endeavours, including the future trajectory of the records and information management industry. AI could easily move from Apple Sir to Amazon Go, and from self-driving vehicles to sovereign armaments (Modiba et al. 2019; Wang & Siau 2019). AIT ensures that records are retrieved efficiently and effectively so that the services are accessible by organisations (Jackson 2011; Prigg 2017). AIT is also used for records management automation, which includes the infrastructure discussed below.

2.6.1 Automated classification

Digital classification is the adoption of categories, labels, tags or metadata for content. This can be done by means of fingerprinting and/or linguistic analysis and it confirms that records are always stored at the right place for easy and quick retrieval (Woodword 2018; Lepak 2019). AIT has the capacity to electronically classify the records for the purpose of easy retrieval through its automated classification algorithm (Gao, Wang, Chia & Tsang 2010). Automated classification algorithm includes the use of classification for a specific document by a predefined rule set. The rule set might be based on similar keywords or expressions found in the content with a given list or recognising some other distinctive of the record (Gao et al. 2010).

Parmenter (2019) explains that AI has made massive improvement in what is normally called computer vision – the capability to identify what it sees and make conclusions. In the fraternity of document management, this capability is useful to optical character recognition (OCR) technology, which allows a Document Management System (DMS) to read the contents of files and robotically organise and internalise it, without human involvement (Ripcord Company 2019). The more files AI reads, the more it can perceive how employees cooperate with the files, and the smarter it becomes at recognising and internalising information (Richardson 2020; Tredinnick & Laybats 2020). In one such instance, the newly developed Nuance Document Imaging, part of Kofax's Intelligent Automation Platform, makes use of OCR for the quick, flexible scanning of files and converting paper records into actionable digital information (Parmenter 2019).

2.6.2 Machine learning

Cohen, Cohen, West and Aiken (2003); Kalaiselvan et al. (2021) suggest that machine learning makes use of statistical methods to offer computers the ability to learn. Machine learning is the utilisation of AI that offers systems the ability to robotically learn and advance from experience without being explicitly programmed (Perc, Ozer & Hojnik 2019). Machine learning focuses on the establishment of computer programmes that can retrieve data and utilise it to learn from themselves (Ali et al. 2020). This means that if records management practitioners are editing documents together, the computer can infer that there is a stronger association with one of those individuals than with someone who has never written a file with them (Woodword 2018). Tredinnick (2017) articulates that machine-learning procedures allow the computer programme to learn gradually more autonomously based on instances and to advance its own developing logic and consequences rather than being programmed. Others go so far as to allocate attributes of inventiveness to AI when, for instance, machine-learning algorithms independently find new solutions to particular challenges (Prigg 2017; Jarrahi 2019).

Once these associations are laid out across manifold stages and content, the computer can figure out much about work partialities and performance, generating a pattern that

can be used in upcoming cases (Jackson 2011). This pattern can assist in building relations among files for records management purposes and assist in diminishing the number of classification faults by recognising what content should be categorised as a file (Cohen et al. 2003; Lepak 2019). It may also assist in grouping similar data, such as all content associated with a specific client across all content sources, which advances efficiency and the partnership experience (Gao et al. 2010).

2.6.3 Natural language processing

NLP is AI that focuses on the connections between computers and human (natural) language (Woodword 2018; Kalaiselvan et al. 2021). It also focuses on how to programme computers to internalise massive amounts of a natural language data utilising linguistic analysis (Melenhorst, Rogers & Caylor 2001) and embraces a huge cluster of digitisation functions, but very little is relevant to records management. NLP can be used to recognise concepts and metadata that are essentially pertinent to the file, as if an individual had physically read and selected the concepts, rather than the concepts that seem most regular (Melton & Hripsak 2005). NLP algorithm can recognise the associations among named attributes (Perc at al. 2019); for instance, it can twitch the name of an individual from the file and electronically look up what division is not mentioned in the document directly (Gao et al. 2010). In the LIS sector, NLP algorithm is a search engine such as Google and YouTube and is an example of AI already commonly utilised by information users. NLP is significant in developing subject indexing, bibliometrics and information retrieval systems as key component in the conception of a virtual library (Cox et al. 2019; Ali et al. 2020).

2.6.4 Automated rules

According to Melton and Hripcsak (2005); Woodward (2018), digitised rules could include monotonous activities on behalf of the records management practitioners. For instance, when a record is organised as a contract, a preservation agenda could be applied robotically (Perc et al. 2019). Utilising thumbprinting and/or linguistic analysis of automated rules algorithm, records management practitioners can robotically recognise when the triggers happen and what rules could be utilised (Jackson 2011; Lepak 2019).

2.6.5 Black box

A black box is a device, system or object that can be viewed in terms of its inputs and outputs (vectors), without any knowledge of its internal workings (Montavon, Samek & Muller 2018). Black box algorithm consists of a set of production functions or even an acknowledged production activity with a limited set of inputs to be attuned to produce a set of outputs conforming to a greatest level of profits or some other measure of owner utility (Andersson & Johansson 2018). Liu (2011) indicates that black box digitisation is connected to NLP and automated classification. It is another type of digitisation that classifies associations between data and envisages that the following data is in order. For instance, one can read how many times a word appears in a file or identify pertinent concepts using linguistic analysis. These can then be associated with other identical files to establish a thumbprint. When imminent files match that thumbprint, one can begin to conclude what metadata might apply to that file (Woodword 2018). This is implemented for records management to be able to classify the relationship between content and data, to confirm that they are organised appropriately, and that the suitable preservation policy has been applied (Nadkarni, Ohno-Machado & Chapman 2011).

2.6.6 Neural network

A neural network is inspired by the human brain and it can be utilised for machine learning and artificial intelligence (Montavon et al. 2018). With these networks, various problems could be solved by using a computer (Perc et al. 2019). It is, to some extent, modelled on the structure of the biological brain (Abiodun, Jantan, Omolara, Dada, Mohamed & Arshad 2018) and consists of an abstracted model of interrelated neurons, whose special organisation and connection can be used to solve computer-based application problems in several fields, such as statistics, technology or economy (Mijwel, Esen & Shamil 2019). Neural networks advance engagement on automated classification by looking at other instances where a class has been applied, like in thumbprinting (Jackson 2011; Woodword 2018). Neural networks' algorithms are tools that assist records management practitioners to organise content for records management purposes, so records management practitioners are more self-confident

in the classification and that the appropriate preservation policy has been applied (Liu 2011).

2.6.7 Deep learning

Deep learning is a kind of machine learning. In this instance, deep learning uses a pyramid of terms, such as a classified file plan, to categorise content (Liu 2011; Woodword 2018). Deep learning is a subcategory of machine learning where artificial neural networks, algorithms stimulated by the human brain, learn from the huge amount of data (Viera, Pinaya & Mechelli 2017). Deep learning algorithm permits a machine to resolve complicated challenges, even when utilising set data that is very diverse, unstructured and interconnected (Ali et al. 2020). For example, a file plan pyramid is a lawful contract and in deep learning, the file would foremost be recognised as a legal file utilising thumbprinting and/or linguistic analysis, then it will only look at categorisation under law to classify it as a contract (Viera et al. 2017). This can be repetitive over numerous sheets; however, in each circumstances, the preceding sheets inform the following sheet of classification (Cohen et al. 2003; Gao et al. 2010).

2.7 USABILITY OF ARTIFICIAL INTELLIGENCE FOR RECORDS MANAGEMENT

Woodward (2018) articulates that machine learning can be used to manage records and dispose of records that are no longer needed or are duplicates. These big data-optimised machines succeed in capturing millions of records in many organisations in America (Ripcord Company 2019). It is easy for a robotic machine to identify, flag and robotically delete replicas. The machines can distinguish between entries like date fields to be used in records retention (Lohr 2011).

2.7.1 Perceived ease of use

Perceived ease of use determines whether the application of AIT would be free of effort when used to manage records. Perceived ease of use is a concept of Davis' (1989) original TAM model established through seven self-report questionnaire items explained as "the extent to which an individual believes that utilising a certain system

would be free of error". If the application is professed to be more flexible during utilisation than another, users are more inclined to accept it (Jahangir & Begum 2008). Perceived ease of use would lead to a certain attitude towards use, behavioural intention to use and actual use. Perceived ease of use also effects the next main concept - professed usefulness (Pinho & Soares 2011). Therefore, AIT for the management of records should be professed for its ease of use in order for it to be adopted and applied for the management of records.

Ilachiniski (2017) and Woodward (2018) explain that the possible application of AIT is compliance. Organisations usually have a few days to gather all records needed for an audit. It is an agitated and error-prone process for HI, but AI can be skilled and programmed to identify keywords, labels or patterns that classify records as pertinent for compliance purposes, and then retrieve them from a repository in minutes (Lohr 2011; Ma et al. 2017).

Moreover, Keily and Hamm (2013) indicate that AIT could help with data quality, which is a predicament that troubles every organisation. This could cause replica matters and hamper the capability of organisations to obtain a complete opinion of their imperative data (Keily & Hamm 2013). With machine learning, computers and robots can be skilled to search for ZIP encryptions that are typed into date fields or records that have an identical address, but different names. The devices can robotically correct many of these errors, allowing organisations to meaningfully advance the quality of their data (Weckerk & McDonald 2007; West 2015; Maderer 2017).

2.7.2 Attitude towards use

The approach that records management practitioners adopt for the management of records would determine if the application of AIT would be effective and efficient. The TAM illustrates that the person's attitude towards utilising technology would regulate their intention to utilise a certain technology and the attitude is, continuously enforced by the technology's perceived ease of use and perceived usefulness (Davis 1989). Pinho and Soares (2011) explain that organisations have attempted to apply AIT to records management for more than 20 years, in most cases without success. One of the major inhibitors to the utilisation of AIT in records management has been the

repetitious and time-consuming methods of training the computer algorithms to look for unequivocal mechanisms and the resistance of records management practitioners for using AIT for the management of records (Jin Ma et al. 2017).

Gill (2019) professes that people are concerned that the application of AIT for records management would put records management practitioners out of work. However, it is likely that records management practitioners would be pleased to get rid of time-consuming activities and AIT would allow them to focus more on their day-to-day work. AIT and machine learning have eventually moved beyond the territory of theoretical probability to real-world application; therefore, institutions across the world should investigate probable ways to apply AIT for records management (Gill 2019). Like any other organisation, the CSIR might be also experiencing human errors that occur when capturing data that describes records that are available in the organisations.

2.8   RECORDS MANAGEMENT ACTIVITIES

Records management activities refer to the following: records creation, records storage, records classification, records retrieval, records preservation and records disposal. Biraud (2013) defines records management as several functions, which an organisation should execute to manage its records accurately. The main functions include: drafting records management policies, allocating activities to records management practitioners, instituting and disseminating measures and procedures for records management, and designing, instigating and managing recordkeeping systems (Biraud 2013). There are also other managerial functions involved in the creation, organisation and indexing, dissemination, handling, utilisation, tracing and protection of records (Ngoepe 2008; Ambira 2016).

2.8.1   Records creation

Smith (2016) elucidates that records are always created when someone in the organisation writes an email, drafts a brief, writes a report or records transcripts, adds information to a spreadsheet, makes a film or sound recording or takes a photo. Records are created as part of a particular corporate procedure and must be administered in such a way that they can be examined, distributed, recycled and

repurposed, and that they add value to the institution (Shepherd & Yeo 2003; Ngoepe & Marutha 2021). When writing has begun or data is produced by a computer or data is recorded either on film/tape, then a record is created. In most cases engaging in business results in a record being created. For instance, when a person communicates business issues via an email or letter, a record that arises serves as proof of the business communication or transaction (Smith 2016).

Other businesses in which records are regularly created include the establishment of agreements, submitting draft papers for endorsement and transferring of invoices. Other corporate functions do not on their own result in the creation of records (Ngoepe 2008). For instance, minutes are purposely created to capture the decisions made at official meetings. More examples of functions that do result in records include the creation of oral decisions and obligations, offering guidance telephonically and receiving funds through the mail (Ngoepe 2008).

However, records must encompass specific information to make them comprehensive, precise and dependable. Records must include the following: what occurred, the order of proceedings, the decisions and recommendations made, what assistance or guidance was granted, when it transpired and who was involved (National Archives of Australia 2019). Records can either be created in a paper-based or electronic format.

According to Franks (2018), paper-based records could be created as soon as the first document pertinent to the record is created to confirm that all related records can be deposited together, without the menace of loss. For instance, when a patient file has been opened, all letters related to that patient are filed in the patient's record. This includes letters, notes and emails that concern the patient; more documents could be added to the folder when needed (Eike-Henner 2020). When items are added to the files, a number should be allocated and written at the bottom of the page to assist keep a record of the order in that they were created and to help ensure that pages are not misplaced. Paper-based records should embrace a 'Paper Record Cover Sheet' at the front of the file (Hodges & McClurkin 2011). The cover sheet gives a clear point of reference for users looking for the record and is used to manage the longer-term preservation of the document. The cover sheet should also specify the level of

sensitivity of the record, which in turn details the level of security to be applied on the record.

Records in an organisation can also be created in an electronic form and medium. An electronic record is a file stored on electronic media that could be accessed electronically (Read & Ginn 2015; Franks 2018). An electronic record consists of data that is captured by a computer and received in the initiation and accomplishment of an institution's or a person's functionality (Cunningham & Montana 2006). Examples of electronic records are emails, word-processed files, electronic worksheets, electronic photos and databases. It also relates to the information typed through electronic measures, and which may or may not have a paper record to support it (Penn, Pennix & Coulson 2016).

Electronic records integrate both analogue and digital information setups, although the perception mainly means that information is deposited in electronic systems (Asogwa 2012). Electronic records also refer to records created in electronic format (born digital) but it is often used to designate images of records in other setups (reborn digital or born analogue) (Franks 2018). Born-digital records are records that have been created in an electronic format (rather than having been digitised from paper records). Examples of born-digital information comprise: emails, manual files (Word files, and Google files), presentations (PowerPoint), worksheets (Excel), PDFs, pictures, videos, CAD drawings, 3D models, and data sets and data bases. A born analogue record refers to information that was created in a non-digital format and subsequently digitised (Ji 2018).

2.8.2 Records storage

Manual records that refer to a client's records, staff files, business documents and exclusive information may be captured in a records storage, allowing the records practitioners to feel safe in knowing that the significant information is sealed in a protected physical storage facility, resistant to data hacks and hard drive malfunctioning (Marutha 2011). Records are boxed, sent to the facility and stored there for monthly fee. When needed, they could be called back to the office, and then (hopefully) sent back to storage again when they are no longer needed (Cunningham

& Montana 2006). The records practitioners should ensure that records are stored in a safe and secured environment (Patel & Chotai 2011). Records should be stored to protect them from vandalism and loss. Paper records should be captured with a technique that allows simple retrieval to legitimate members of staff and offers enough measures for protected storage to prevent illegitimate persons obtaining access to them, such as protected filing shelves (Cunningham & Montana 2006).

Records should be grouped and rationally categorised within their storage facility to help them be retrieved with the most suitable method, such as, chronological and alphabetical arrangements (Shepherd & Yeo 2003). Paper records should be stored in a way that preserves the quality and reliability of the record for as long as they are needed. Cabinets or boxes should not be overfilled to the point that records could be damaged. Boxes should be stored on the ground and should not be weighted to the point that the bases of the boxes are crumpled under the weight (Yuba 2013). Paper records should be stored in local storage while they continue to be active and are then moved to the offsite storage facility for the duration of their holding period, according to the file plan. More information should be captured displaying the position of a file for the life of that document (Adam 2008). Different from paper-based records, automated records can be captured in numerous formats and on several media platforms (Cunningham & Montana 2006). For instance, an electronic record can be captured as both a Word document and as a portable document format (PDF). The Word document can then be stored in a centralised computer server, while the PDF can be stored on a memory stick. The same record can exist in two different locations and in two dissimilar formats (Adam 2008; Ji 2018). Therefore, both analogue and automated records can be captured in the following records storage facilities.

Paper-based records are classified properly on the shelves for quicker and easy retrieval, whether in archives or in records offices in both private and public organisations (Hodges & McClurkin 2011). Records are either stored in binders or records, in a storage box or classified in folders on the open shelves (Yuba 2013). Records can be classified alphabetically from A-Z, meaning the first record according to the alphabet comes first and the last comes last. Records can also be shelved numerically; in this case, records are allocated numbers to every record that is created. Those records would then be filed according to those file numbers (Boles 2005) and

can be traced in the storage in this manner. Records can also be filed alpha-numerically, meaning the file number given to each file as created consists of letters of the alphabet and numbers. Records management sections and archives are guided by a file plan to determine how they file their records. However, records would be filed in such a manner that it would be easy to retrieve them (Craig 2004).

Fireproof and waterproof space is a benefit for the storage of paper-based records. Records management practitioners must ensure that the room at the document storage facility is adequately protected and that it preserves the facility's information (Jarrahi 2019). The storage facility includes durable archive boxes, a temperature-controlled environment and protection against natural disasters. The room should also have the latest fire detection system and flood protection is paramount to avoid compromising vital physical records. The second feature is closed circuit television (CCTV) and intruder detection. To protect records from being stolen, there should be all kinds of protective measures, including the CCTV and latest intruder detector system. This would ensure that records are protected day and night (Iron Mountain 2019a). The third feature is controlled access. Organisations should ensure that only authorised persons have access to the company's records, and, in most organisations, a biometrics system is installed to minimise access to where records are stored. The last feature is a thorough cataloguing system. This ensures that records are captured correctly so that when they are retrieved, access would be quicker (Iron Mountain 2019b).

Electronic records and documents would require appropriate system such as EDRMS for safekeeping and easy retrieval. EDRMS is a cohesive system created for the management of electronic documents and electronic records created in organisations. EDRMS is utilised by institutions to manage records through the document life cycle, from creation to destruction. EDRMS is commonly regarded as EDMS or ERMS, which is s system particularly created to manage the maintenance and disposal of records (Xie 2006). EDRMS maintains the context, content, links and structure among records to permit their retrievability and support their value as evidence. It is a system that gives the alternative of adding records to an online storehouse and correlating properties with those records to ensure it is easier for the users to access and retrieve them. It also offers a technique to check records in and out so that supplementary

versions can be generated and reserved without overwriting the preceding versions. It enables partnership by permitting all parties to concurrently locate and use the most current version of electronic record (Duranti, Eastwood & MacNei 2002).

EDRMS is a technical system that offers a complete and versatile solution for managing the creation, indexing, capturing, accessing and disposal of the documents and information resources of an organisation (Johnston & Bowen 2005). According to Techopedia (2018), EDRMS is the administration and organisation of the records of an institution via the records life cycle. The functions in the records management comprise the organised and effectual control of the creation, preservation and disposal of the records. According to the National Archives of Malaysia (2011), EDRMS possesses characteristics such as authenticity, meaning the records can be demonstrated to be what it intends to be, to have been generated or sent by the individual who created or sent it and to have been created or sent at the time it is supposed to have happened. Reliability is another characteristic of EDRMS, which means the record can be reliable as a complete and truthful depiction of the transaction they confirm and can be depended on during the subsequent transaction (Xie 2006). The characteristics also include integrity, which means the record is complete and unaltered and protected against unauthorised alteration. Usability is another characteristic of EDRMS, which means that record can be located, retrieved, preserved and interpreted (National Archives of Malaysia 2011).

The benefits of electronic document storage include better collaboration. This storage facility allows everyone access to the right document at the right time. It is easy to allocate utilisation rights over the system. The system would also create a correct log of individuals who have retrieved data, modified files and created a deleted document (Darcy 2017). Another benefit is a higher level of security. In the digital environment, unauthorised activities become challenging when accessing data when using electronic document storage system. However, an ERMS comes with several security features. File encryption and other levels of access and authentication system would keep documents safe (Fernandez-Aleman 2013).

The other latest technology for the storage of electronic records and document is cloud storage. Askhoj, Sugimoto and Nagamori (2011) define cloud storage as a secured

and effortlessly accessible storage, allowing it to be an extraordinary platform to store most of the organisational data. Cloud storage is a framework of computer data storage in which the electronic records are stored in coherent pools (Franks 2018). It is the physical storage that spans multiple servers (sometimes in multiple positions), and the physical environment is preserved and managed by a responsible institution. The cloud storage suppliers are responsible for making the records available, and for safeguarding the physical environment and making it operational. Institutions purchase and lease storage capacity from the suppliers to store user records, institutional records or application records (Duranti & Rogers 2019).

Cloud storage suppliers apply baseline protection for their platforms and the data the process, such as authentication, access control and encryption (Montjoye et al. 2017). One of the encounters with cloud storage security is that the employees utilise free file distribution and cloud storage services that are not permitted by the organisation and may not satisfy minimum security standards. Knowingly or not, employees can put the organisation data at risk by making use of these services, especially without the IT department's knowledge or endorsement (Duranti & Rogers 2019). Institutions storing their records in the cloud would be able to ensure that records would only be accessed by staff with authorisation. These organisations should only ensure that records management practitioners are well informed so that they do not compromise the security of records (Duranti & Rogers 2019).

2.8.3 Records organisation/classification

Classification is the process of allocating records to their suitable place within a sequential allocation, permitting them to be located. In the records management industry, classification is fundamental to categorising information, comprising the information entrenched in files, into an organised structure for regulatory and accessibility purposes. Classification suggests giving records an exceptional identifier or reference number, allocated according to classification rules (Mokhtar & Yusof 2017). The classification of records has to take into consideration the prevailing structure, occupations and activities of the institution and its branches. Therefore, files may be organised in a manner that resembles the work being filed, making it simple to

decide where records should be captured and where they might be located (Foscarini 2009).

Classification includes arranging records into high-class groupings so that they would be clear about the appropriate place for an individual element. The high position classification would be the sequence, but in a classification arrangement of any intricacy, there would be further separations into sub-series (Yuba 2013). Smith (2016) indicates that a classification system must resemble the institution it services, allow reference codes to be allocated to each element that needs classification, be completely filed so that the classifier rules, structure and terminology utilised to organise records are reliable and specific, and be kept up to date suitably to replicate changes in purpose and activities. Records classification is important because records management practitioners can segregate records of value from records of little value. Records classification also helps to narrow down places where reliable records might be residing in the organisation (Duffus 2016).

2.8.4 Records retrieval

Kutade and Dhamal (2014) define records retrieval as the specified user request over a group of available records. Easy retrieval of records allows the users to access records quicker at any given time. When records are accessed quickly, the users can perform their tasks effectively and efficiently (Pyrene 2015; Ngoepe & Marutha 2021). These files could be any kind of record, primarily unstructured records, such as newspapers and real estate files. Records retrieval is the ability to search for documents by keywords and other features such as date and author. It implies that the record has been indexed on all suitable fields and that keywords have been selected based on the title and textual content (McLeod & Hare 2005). Read and Ginn (2015) opine that records retrieval is all about giving access to the right records to the right people, at the right time. Records retrieval could consist of three functions: literally collecting a copy of a file, locating were some known record is currently stored and categorising which record, if any, suits some description (McLeod & Hare 2005). For records to be retrieved, standards and procedures should put in place that assist records management practitioners or researchers in locating those records (McLeod & Hare 2005).

Manual records are retrieved or accessed from the shelves or cabinet with file or reference numbers. A file or reference number is a number given to the file when created so that it would be easy to store the record (Mampe & Kalusopa 2012). Therefore, such a number would be used to retrieve or have access to the records on the shelfs or in the cabinets. The user or researcher would get the file number from the records practitioner immediately after making a request to the record, after which the user or researcher would then use the file number to retrieve the requested record (Biron, Metzger, Pezet, Sebban, Barthuet & Durand 2014). Electronic records are retrieved by entering the subject, reference number, keyword or any other information of the records needed as programmed and generated by the system. The researcher would then decide whether they save or print the file for better use (Thurston 2005; Iwhiwhu 2005).

2.8.5 Records preservation

Preservation is defined as a variety of activities related to sustaining materials in a usable state, whether in their original form or in some other usable form. Preservation helps archivists and records management practitioners to use the records again because such records are still accessible and in good condition to be used again (Kootshabe & Mnjama 2014). This study subscribes to the notion that preservation relates to assigning of resources, and planning and executing of policies, procedures and processes encompassing maintenance, examination, conservation and refurbishment in order to confirm adequate protection of documents (Ngulube 2003). Preservation integrates the storage and handling of records (Arp 2019). Iyishu and Nkanu (2013) opine that preservation refers to recognising and photocopying impaired resources to reinstate their value with the purpose of accessing the information they contain. Preservation is a perception referring to the reflexive protection of archival resources in which no physical treatment to them transpire.

Preservation of records and archival management is carried out to prevent information materials from disappearing and to prevent the staining of papers and media materials that would result in the loss of the information they incorporate so that there is a need to preserve these records (Rhys-Lewis & Forde 2013). However, it is expensive to

keep all the institutional records due to the costs related to staff, money and space. The cost of keeping records includes maintenance, migration, cataloguing and accessibility of all the conserved records. According to Lor and Snyman (2005), electronic records preservation would need perpetual maintenance of specialised resources to read old-style electronic material and it would need ongoing creation of stored records in current formats. However, it would be unrealistic to keep institution-generated records permanently (Ngulube 2003). Preservation involves recording keeping activities such as maintenance, examination, conservation and restoration.

The maintenance process includes the regular maintenance of records and archives, certainly in the existing and semi-current records environment, when they are stored in offices or records sections; preservation improves the general protection of records against conservational risks or other physical damages (Duranti & Rogers 2019). Examination of records incorporates preliminary techniques applied to regulate the original resources and structure of an element and to regulate the degree of its deterioration, modification or loss, and should be carried out during the preservation process (Harris & Schur 2006).

During the conservation process, the protection of archival resources should be done by the limited physical treatments required to counterattack further deterioration, which would not unfavourably distress the reliability of the original material or source (Putcell 2019). Restoration is the function that repairs an element when a replica of the original tool is extremely significant than the conservation of the reliability of the tool. Restoration is not usually regarded as an archival function (Harris & Schur 2006). These activities are undertaken to physically protect and defend records and archives (Ngulube 2003).

2.8.6 Records disposal

Records disposal refers to the ultimate stage of record management in which records are destroyed or permanently stored in an archive's repository. Records disposition also refers to the decisive fate of records, that is, whether they are destroyed or stored permanently as archives (Jackson 2019; Arp 2019). Garaba (2015a) indicates that disposition is an authoritative element of records management. When accurately

completed, it confirms that the institutions hold records for as long as they are required and until they are no longer required, then they dispose of them through a suitable method, for example, by transferring them to an archives repository (Rhys-Lewis & Forde 2013). Organisations benefit from disposing of their records. Records disposal circumvents storage space obtain by utilising an office or server vicinity to preserve records not required by the institution (Putcell 2019). Records disposal also agrees with the data protection principle if records comprise personal information (this principle makes it compulsory for institutions to not keep personal information for longer than obligatory). Furthermore, through records disposal, discovering and accessing, records are faster and simpler because there are no more to search (Garaba 2015b; Duranti & Rogers 2019).

Many institutions follow the various methods when disposing of records. Paper records that are exempted from suitable disposal approaches are burning, pulping, pulverising and shredding (Cook 2014). Nonetheless, section 11(2) of NARSSA Act 1996 states that public records are under disposition authority, as they have enduring value and must be relocated to the archives storage when they have existed for 20 years. However, electronic records consist of information that is confidential or exempted from appropriate disposal approaches, which encompass physical disposal of the storage medium such as by destroying or burning or by high-level overwriting that reduces the data to being unrecoverable (Lor & Snyman 2005). Non-paper media comprise information that is confidential or exempted from discovery, such as audio tapes, video tapes, microforms and photographic films, and suitable disposal approaches include pulverising, shredding and chemical disposal/recycling (Yuba 2013; Cook 2014; Smith 2016; Jackson 2019).

2.9 RECORDS MANAGEMENT ACTIVITIES DISCHARGED THROUGH ARTIFICIAL INTELLIGENCE TECHNOLOGY

This sub-theme presents records management activities that may be possibly carried out through AIT.

2.9.1 Records image

Robotics such as Ripcord robot make use of an amalgamation of robotic scanners and AI-powered programs and software to perform all records management activities (Nichols 2019). The activities include removing staples and scanning records to mechanically convert them into searchable text and upload them to a cloud server (Ripcord Company 2019; Demaitre 2020). The robot can scan all forms of records, from business cards to huge architectural drawings. For example, Ripcord has the capability to automate 80 per cent of the conversion procedure, which includes paper treatment, and quicker removal and digital imaging (McKinsey Global Institute 2017). The robot collects paper, pulls out any staples and stacks them one sheet at a time onto a conveyor belt for rapid scanning. These machines can scan up to one sheet per second (Jackson 2011; Ripcord Company 2019).

2.9.2 Records shipping and packaging

Records management practitioners have the responsibility to package and ship the records to the robotic machine (Demaitre 2020). Upon receipt, the content would be logged, allocated a unique barcode and tracked as it moves through the digitisation process (McKinsey Global Institute 2017; Ripcord Company 2019). Through the utilisation of AIT such as machine learning, functions that are usually allocated to many staff members and that take hours to complete, can be completed quickly and easily (Weckerk & McDonald 2007; Ripcord Company 2019).

2.9.3 Document arrangements and organisation

The robotic machine arranges and formulates records for digitisation and speedily digitises each record in full colour at high resolution and manufacture a fully accessible PDF of each file (Demaitre 2020). The records are tightly stored and administered via the robotic machine's canopy, which refers to records management places (Ripcord Company 2019; Petropoulos, Marcus, Moes & Bergamini 2019). Records at the CSIR would be orderly stored and easily retrieved through AIT. The AI-powered DMS has implausible potential to rationalise the content and paper development workflow. Although no leaders have emerged around this encounter, applications

like Grammarly are representing how AI can be used to "pre-edit" papers without extra human interference (Bailey 2019). This is one place where an AI-powered DMS has the ability to read, comprehend and bring shape to unshaped remarks, which would certainly streamline the procedure (Parmenter 2019).

2.9.4 Access to records

A robotic machine's canopy permits the records management practitioners to swiftly search and trace the records with keywords, Boolean Logic and filtered search (Ripcord Company 2019). Discovering that needle in the haystack is just a few keystrokes away and does not need a team to go through mountains of files (Bowser et al. 2017; Ripcord Company 2019). Records management practitioners would make use of a computer program such as a database to retrieve records, regardless of the location. Records can then be downloaded, sent via email or printed for researchers (McKinsey Global Institute 2017). Unlike the ordinary ERMS, a robotic machine's canopy is an embedded facility that is linked to robotic machines such as ripcord so that records would be searched via such functionalities. The facility is programmed in such a way that it cannot work on its own because it is linked to the robotic machine (Ripcord Company 2019).

2.9.5 Security and compliance

When files are deposited in more places such as offices, file rooms and third-party storage, it becomes more stimulating to impose security and compliance legislation (Reddy et al. 2019; Iron Mountain 2019a). Robotic machines such as Ripcord Canopy assimilate with the prevailing identity management resources like Active Directory; this refers to Microsoft which was established for the Windows domain network. It is included in the most window server operating systems as a cluster of procedures, services and Lightweight Directory Access Protocol (LDAP), which refers to a software protocol for permitting records management practitioners to detect organisations, persons and other facilities such as documents and devices in a network, whether on the public internet or on a business intranet, data is encoded both in transit and at rest, and records management practitioners could set access and preservation guidelines for compliance (Singh 2008). Managing preservation and disposal guidelines is the

main component of any records management program. Robotic machine such as Ripcord Canopy's analytics and reporting dashboard permits the records management practitioners to quickly recognise records prepared for disposal (Jackson 2011; Ripcord Company 2019).

Parmenter (2019) elucidates that security is more of a difficult phenomenon than ever before, particularly when it comes to delicate records in financial facilities or healthcare institutions. An AI-powered DMS is exclusively situated to offer file protection at scale. AI, for instance, can be skilled and programmed to notice delicate and private identifiable information (PII) in files and then flag those files for different treatment (Bailey 2019). Automated classification and processing can certify that no records are left in unsafe sites before they are actioned. The discovery of irregularities can also be organised to detect and flag possibly deceitful files (Parmenter 2019; Lepak 2019).

2.9.6 Documents clustering

Document clustering is a different version of the data-clustering problem. Data clustering is explained as the organisation of a set of objects into disjointed subsets called a cluster (Tarczynski 2011). Clustering algorithms are habitually used in web search engines to mechanically group webpages into categories that can be searched effortlessly by a user. Parmenter (2019) articulates that the term of utilising certain programming to accomplish group examination of a body of files has been behind search results of web records for some time. However, the use of AI for this function brings with it a far more sophisticated level of complexity and accuracy. An AI-powered DMS can extremely precisely allocate a business's vast library of files to various subjects or ladders (which is particularly helpful when themes and levels are not previously known), comprehend relationships between records within a wider context, form implications and hypotheses, and determine resemblances between files (Bailey 2019).

The result is quicker classification, organisation and search of company records when a profound dive is needed. iManage RAVN's software categorises and excerpts key files. By comprehending and unifying data and information, the program classifies, and groups based on resemblances and significance (Bailey 2019). From there, RAVN can

even excerpt evocative data from contracts, financial statements and other documents, making it simple to work through years or even decades of documents to get precisely what is required (McKinsey Global Institute 2017; Lepak 2019).

2.10 PERCEPTION REGRADING ARTIFICIAL INTELLIGENCE TECHNOLOGY

Jackson (2011) and Ripcord Company (2019) indicate that AIT has already been adopted and applied in the LIS fraternity, with many organisations in United States of America and China, advancing billions of rands towards the activities that assist in digitising their records management services and providing quality library services. The utilisation of AIT in the LIS industry at the United States of America and China has been accepted by information professionals in various organisations (Jackson 2011). AIT was regarded as useful and the behaviour of the information professionals towards the utilisation of AIT in the LIS industry is positive.

2.10.1 Perceived usefulness

AIT is assumed to be effective and could enhance productivity at any institution by managing records effectively and efficiently. Perceived usefulness is a concept of Davis's (1989) original TAM model established via seven self-report questionnaire concepts explained as the degree to which an individual believes that utilising an information system would improve their productivity. Perceived usefulness is one of the autonomous concepts in TAM (Davis 1989; Knox, et al. 2021). Lohr (2011) purports that the application of AIT has already been connected to advanced electronic records management. Robotic machines are able to categorise records with a high degree of precision and accuracy.

According to Maderer (2017), institutions that used AIT for digital records management in its primary phases encountered challenges such as categorisation and classification of records. The major challenge is that AIT cannot just automatically begin to efficiently manage the records; it should be trained in how to run correctly since the process is gradual. The training needs of staff should also be systematically identified to ensure proper and effective machine learning to effectively and efficiently manage records (Jackson 2014; Maderer 2017; Lepak 2019).

Jackson (2014) mentions that it can cost a big investment of time and knowledge to guarantee that it is set up properly. Moreover, algorithms, technology, retention schedules and records management vary in time and would need an AI mechanism to be efficiently reskilled (McFarlane 2016). However, AIT has been recognised to struggle with solitary points of cataloguing (Maderer 2017). Knowing just one element of a file, such as cataloguing (type or topic), might help for searching, but it is not good enough to automate the records management system. Unstructured records are predisposed to encompass manifold classes or topics for various reasons (Jackson 2014).

2.10.2 Behavioural intention to use

Behavioural intention to use is a concept of Davis's (1989) TAM, which records management practitioners should take into consideration when adopting and applying a new technology such as AI and robotic machines in their place of work. Records management practitioners should demonstrate their intentions and determination to adopt and apply AIT in their respective institutions.

In the opinion of Walker (2012), behavioural intention to use and adopt new skills and technology is the inclination or degree to which a person is deliberately equipped to perform or not perform a certain function. One of the views that are persistent among numerous models is that users' behavioural intention to utilise a technology or embrace a skill that leads to the genuine utilisation of the new technology is imperative in any organisation (Ajzen & Fishbein 2005; Knox, et al. 2021).

In countries such as China and the United States of America, information professionals demonstrated the intention to adopt and apply AIT for the provision of information services. For example, Xiaotu in China was applied to provide library services and Ripcord was applied in the United States of America to manage records (Yao et al. 2015; Ripcord Company 2019). Yao et al. (2015) view AI as effective in the provision of library services, particularly in China. Ripcord Company (2019) also views the utilisation of AI as effective in the management of records in America. Furthermore,

Libby robot was adopted by the University of Pretoria library in South Africa to provide reference and information services (Mathibela 2019).

Wehbe, Al Zaabi and Svetlonovi (2018) view the application of AI as crucial role player in the management of healthcare records management. The authors specify that healthcare-related technology has become increasingly holistic from electronic healthcare records and personal health trailers to population health management equipment. In this research, the scholars projected a joined AI blockchain healthcare records management system. The aim is to offer a stage that influences blockchain and AI must (a) protect healthcare-related records management, (b) effectively incorporate data and (c) perform consistent computer-assisted analyses. A goal-oriented modelling method with a constrained goal model is used to prompt the system prerequisite. Questionnaire outcomes for a case study in Abu Dhabi served for model authentication and modification for exploiting the number of system operators.

RecordPoint (2019) is of the view that the volume of data being managed is increasing. However, machine learning provides promising methods to assist with the complicated activity of classifying records. Records managers do not have to fabricate complicated sets of rules created on record metadata. Records managers can train in machine-learning algorithms to perform the record metadata function by examining the actual documents (Demaire 2020). Parmenter (2019) also states that AI is becoming a powerful multiplier in records management. It has the capability to make every phase of the workflow healthier, cleverer and quicker from the internalising of records to their storage to the withdrawal of the information they hold. It is already eradicating lost time, enhancing and cultivating partnership and engagement, and shortening turnaround times on mutual workflows.

2.11   SUMMARY OF THE CHAPTER

This chapter discussed the literature review based on the utilisation of AIT for the management of records. Furthermore, the chapter covered the following themes: the necessity and significance of the literature review, literature review procedure and sources, referencing of sources, mapping of research literature, records management policy framework, records management activities, perception of records management

practitioners regarding the use of AIT for the management of records, usability of AIT for the management of records, and AIT infrastructure for the management of records. The next chapter deliberates on the research methodology of the study.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1   INTRODUCTION

The previous chapter reflected on the literature concerning the records management activities with emphasis on the utilisation of AIT for the management of records. The chapter also reflected on the legal framework, the status of records management in the public sector, the applicability of AIT for the management of records and the perception of users pertaining to the utilisation of AIT for the management of records. This chapter addresses the research design and methodology applied in researching this topic. The research design and methodology fixated on finding responsible answers to the research question (Babbie 2013). The research design is the actual planning of the research project and illustrates the kind of study commenced, while the research methods illustrate the steps implemented, tools utilised and methods executed to complete the research project (Babbie & Mouton 2001). This chapter also encompasses numerous steps that the researcher generally adopted in developing his research design/techniques as well as the methodology (Burns & Grove 2005; Marcyk, DeMatteo & Festinger 2005; Novikov & Novikov 2013; Creswell & Creswell 2018; Ngulube 2020a). This chapter also includes research paradigm, research methodology and approach, research methods, data analysis, reliability and validity of the study and ethical consideration.

The paradigm adopted by the researcher in this study was pragmatism. The pragmatic paradigm guided the adoption of the mixed methods in this study as its emphasis is on the utilisation of AIT for the management of records in South Africa. Creswell and Creswell (2018); Kaushik and Walh (2019) state that a pragmatic paradigm is a mixed methods research worldview. The researcher used the pragmatic worldview because of the nature of the topic and the problem statement of the research investigated because the topic and the research problem cut across four disciples (records management, AI, computer science and mechanical engineering) and that made it broader for the researcher to only apply a one-sided philosophical worldview such as a positivist and interpretivist worldview. The multidisciplinary nature of the research

problem requires a well-balanced application of the qualitative and quantitative approaches so that the researcher could broadly investigate the research problem of this calibre. Hence, the mixed methods approach with the pragmatic philosophy was adopted in this study. According to Doyle, Brady and Byrne (2016); Creswell and Creswell (2018), a mixed methods approach is recommended for adoption in a study when researching a complex and broad research topic. Hence, the mixed research methods approach was applicable in this study. Figure 3.1 demonstrates the pathway of the research methodology.
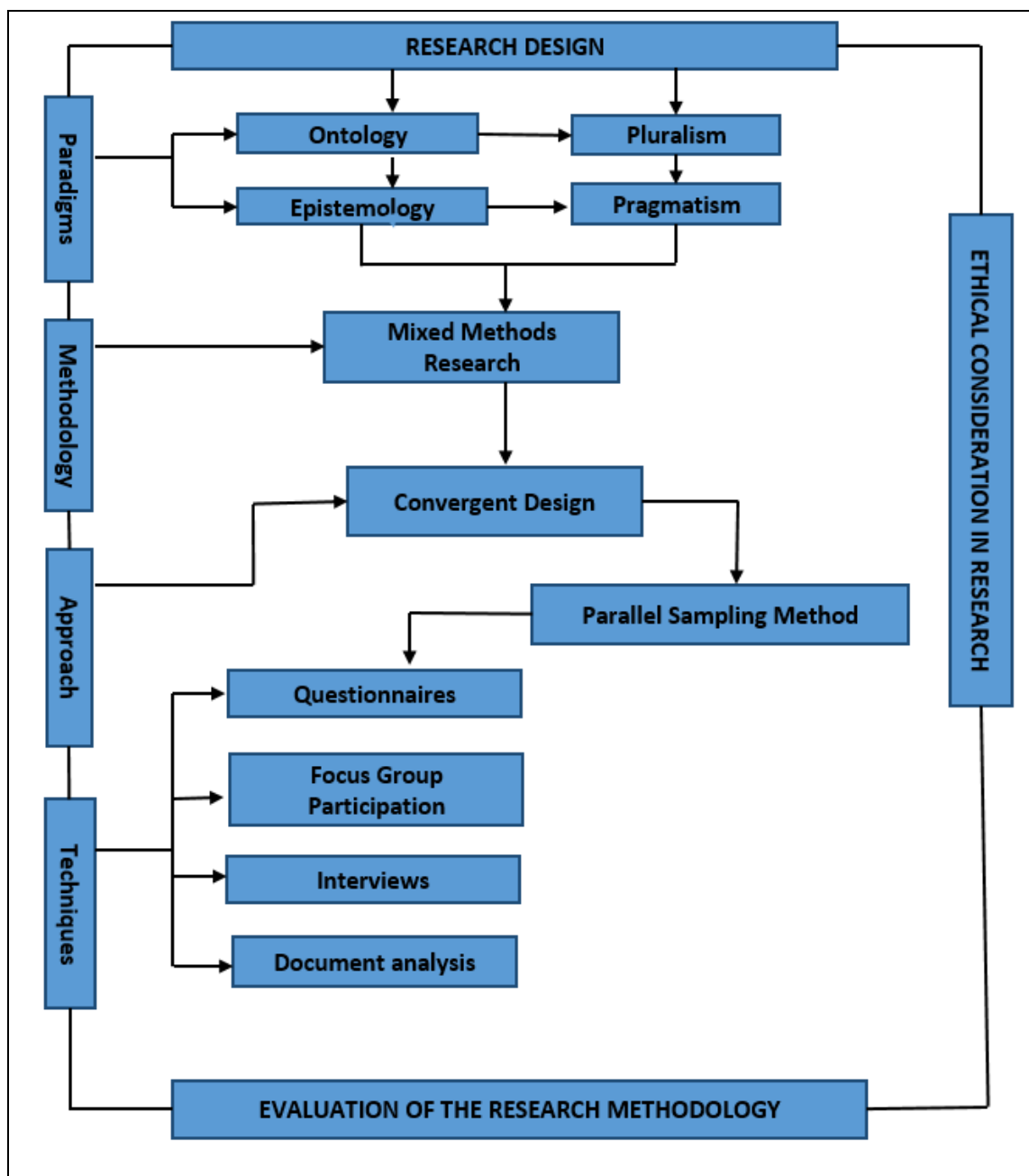
Figure 3.1: The map of the research design (Ngulube 2019)

3.2   RESEARCH PARADIGM

A paradigm refers to a 'theoretical worldview' and it is also termed "epistemologies and ontologies or generally perceived as research procedures" (Creswell 2014) or "explanatory framework" (Creswell & Creswell 2018) or "theoretical traditions" (Babbie 2013). Creswell (2014); Jason and Glenwick (2016) indicate that there are some inconsistencies and arguments among various philosophers and scholars about whether paradigm, epistemology and ontology are identical, whether they mean a similar or diverse thing or whether they are just connected. Bryman (2012); Creswell and Creswell (2018) perceive the three terms at various stages as they emphasise that paradigm leads the researcher with the basis of their investigation constructed on various epistemologies and ontologies. Bryman (2012); Taylor, Bogdan and DeVault (2016) further define paradigm as a "collection of beliefs and decrees", which technically leads the researcher to what they should investigate in their field of study, and which impacts on the methods for examining and interpreting data. Creswell and Plano-Clark (2018); Corbett and Kember (2018) describe paradigm as "a world view fundamental to the philosophies and procedures of a specific topic, directing to a specific way of observing a particular concept".

Bryman (2012); Creswell and Plano-Clark (2018) further explain that a paradigm implies a design, a structure and an outline or system of systematic and academic thoughts, ethics and expectations. Terre Blanche, Durrheim and Painter (2006); Corbett and Kember (2018) opine that the research procedure has three main dimensions, which are ontology, epistemology and methodology. These are theoretic situations that are essential in the procedure of research and the scientist's proclivity to the theme as they profile the methodology to philosophy and the procedures employed by social scientists (Furlong & Marsh 2010). Ontology and epistemology are established on the researchers' beliefs and individual inducement around the origin of the world (Hay 2002).

Bryman (2012) recognises a paradigm as a collection of beliefs and decrees which, for scientists in a particular field of study, influences what should be researched, how a study should be done and how outcomes should be analysed. Paradigms are conflicting worldviews or belief systems that are replications of and leads to the

conclusions that the scholars make (Teddlie & Tashakkori 2009; Romm 2018). Teddlie and Tashakkori (2009) argue that there are critical paradigm issues, especially in mixed methods literature consisting of ontology, epistemology, axiology and methodology. However, Ngulube (2015) argues that the research paradigms comprise the ontology and epistemology. Therefore, the researcher in this study followed the studies of Bryman (2012); Teddlie and Tashakkori (2009) and opted for Ngulube (2015) and based his research paradigm on the ontological and epistemological perspectives. Having considered Teddlie and Tashakkori (2009); Ngulube (2015), the researcher in this study considered using the two major philosophical perspectives – ontology and epistemology.

3.2.1 Ontology

Before describing the kind of ontology utilised in this study, it is imperative to explain the concept ontology. Ontology is explained by Crotty (2003) and Mack (2010) as the "concept of being". It is concerned with "what type of the universe we are scrutinising, with the status of actuality, and with the structure of realism as such". Creswell and Plano-Clark (2018) state that ontology refers to the status of actuality (and what is factual) that scholars undertake when they investigate their research problem. Bryman (2012) indicates that the ontological perspectives are those that reply to the enquiry "what is there that can be of public knowledge?" or "what is the status of the truth?" Mack (2010) and Crotty (2003) indicate that ontological expectations encompass realism (the world of objectivity) and relativism (governed by subjectivity). The SAGE Online Dictionary of Social Research Methods (2006) describes ontology as "a phenomenon associated with the existence of, and affiliation between, various features of the community such as social players, cultural standards and social features." Richards (2003) defines ontology as the perspective that researchers create concerning the type and standards of actuality and what occurs. Snape and Spencer (2003) describe ontology as the status of the universe and what researchers can have knowledge about it.

Moreover, Bryman (2012); Corbett and Kember (2018) and Romm (2018) present the term of "social ontology", which they describe as a theoretical contemplation in a study that is about the status of social objects, such as whether these social objects are or

can be objective objects or are social erections in themselves erected up from the perspectives, actions and clarifications of the persons in the community. Equally, Ormston et al. (2014) proclaim that ontology is about the enquiry "whether or not there is a social actuality that exists autonomously from human perspectives and clarifications and, carefully connected to this, whether there is a communal social truth or only manifold, context-specific ones." In short, ontology is about our beliefs concerning the type and status of the truth and the social world (what exists).

However, Ngulube (2015) concurs with Crotty (2003) and Mack (2010), but added the third ontological assumption, namely pluralism associated with the mixed methods research. Bryman (2012) and Frost (2011) point out that pluralism in simplest terms proposes the combination of paradigms, data and analysis procedures to stimulate deliberation with variety, to vigorously pursue comprehension across ranks of modification and to access individual and procedural dialogue to endorse and nurture comprehension of research problem and results. In its modest terminology, pluralism signifies multiplicity. This could be a multiplicity of values, practices and opinions of a concept (Frost 2011). Pluralism recognises the variety of pragmatic worldviews within and across methods, and it emphasises their combination to reduce the probability of reductionism of the data or the denotations in it to bring diverse viewpoints to the study (Ngulube 2019).

However, Ngulube (2015) opines that pluralism and pragmatism are the outcomes of trying to close the gap between the realism/positivism and constructivism/positivism ontological and epistemological perspectives. Having given these descriptions of ontology, it is now worth recognising the ontology of this study. Pluralism was used as an ontological perspective in this study because it is best suited in mixed methods research such as this study. The pluralist ontological perspective was adopted because the researcher intends to suggest the mixing of research methods, data and analysis techniques to investigate the utilisation of AIT for the management of records.

3.2.2 Epistemology

Epistemology is a mode of comprehension and clarifying how researchers have knowledge of what they know (Crotty 2003). Epistemology is also concerned with the

offerings of a logical foundation for determining what types of knowledge are probable and how researchers can confirm that they are both passable and genuine (Creswell & Plano-Clark 2018). Poetschke (2003) defines epistemology as the framework of knowledge. Epistemology in general is the prospects that researchers create concerning the type or the status of knowledge (Richards 2003) or how it is likely to discover information about the universe (Snape & Spencer 2003). For Crotty (2003); Saunders, Lewis and Thornhill (2019), epistemology is a technique of observing the universe and creating meaning out of it. It inevitably comprises knowledge and exemplifies a particular comprehension of what that knowledge involves.

Crotty (2003) and Van de Ven (2007) further explain that epistemology concerns the "status" of knowledge, its prospect (what knowledge is probable to do and what is not), its scope and legitimacy. Bryman (2012) describes epistemology as "a matter that is about the enquiry of what is (or could be) viewed as adequate knowledge in a study". To continue explaining what epistemology entails, Cohen, Manion and Morrison (2007) and Babbie (2013) indicate that epistemology concerns the perception which an individual creates about "the very degree of knowledge, its status and form, how it could be developed and how it could be interconnected to other individuals". Moreover, all the above scholars stress how the type of epistemological expectations, which researchers create concerning knowledge intensely, affect how scholars go about investigating knowledge of social attitude.

Flick (2015) and Ngulube (2015) explain that the epistemological perspectives are as follows: positivism (used in quantitative approach), interpretivism (used in qualitative approach) and pragmatism (used in mixed methods research approach). Ngulube (2015) identifies pragmatism as an epistemological perspective that is applicable in a mixed method research. Based on the above definitions of epistemology, it is worth identifying the epistemology of this study.

Pragmatism was used as the epistemological perspective of this study based on Ngulube's (2015) view that this pragmatism approach can best be applied in mixed methods research. Pragmatism is a theoretical drive that embraces those who claim that a philosophy is true if it operates acceptably (Cassell, Cunliffe & Grandy 2018). It further embraces that the meaning of a philosophy is to be found in the practical

outcomes of accepting it, and that unpractical ideologies are to be denied (Creswell 2014). Pragmatism is associated with mixed methods research (Teddlie & Tashakkori 2009) because it gives an alternate worldview to positivism/post-positivism and constructivism and concentrate on the problem to be investigated and the outcomes of the investigation (Miller 2006; Creswell & Plano-Clark 2018).

The pragmatic paradigm is a cluster of values, demonstrated above, ascended as the only paradigm reply to the discussion around the "paradigm wars" and the advent of mixed methods and mixed models' methods (Creswell & Creswell 2018). It is diversely constructed on the refutation of the enforced choice amid post-positivism and constructivism (Johnson & Christensen 2014). The pragmatic paradigm has what Jason and Glenwick (2016) regard as a natural plea, and the permission to study the field that is of interest, encompassing approaches that are appropriate and utilising the results in a positive manner in accordance with the value system held by the researcher (Hahn & Oaksford 2007; Creswell 2014). For this purpose, it could be contended that the pragmatic paradigm could be accepted for social and management research activities as this is compatible with the mixed quantitative and qualitative method accomplished within the parameters of "practitioner-based" research.

3.3 METHODOLOGY

Research methodology is a technique to methodically resolve the problem of the research. It might be comprehended as the science of learning how research is done systematically (Saunders, Lewis & Thornhill 2016). In the research methodology the researcher studies the numerous steps that are normally accepted by researchers in studying their research problem, along with the logic behind them (Saunders et al. 2019). It is a science of studying how research is to be carried out (Creswell & Creswell 2018). Research methodology is also explained by Fidel (2012) and Ngulube (2013) as a technique to systematically clarifying the research problem and can be implicit as a technique of reviewing how an investigation is conducted methodologically (Kothari 2004).

Research methodology is the procedure through which the researcher goes about their work of explaining, describing and predicting the phenomena (Bryman 2012). It is also

explained as the study of approaches through which information is gained (Cassell et al. 2018). Its goal is to provide the working plan of the research (Creswell 2014). The research methodology used in this study was the mixed methods methodology, which is maintained with convergent design and parallel sampling methods.

3.3.1 Mixed methods research

Creswell and Plano-Clark (2018) and Ngulube (2020a) explicate that in mixed methods research, both qualitative and quantitative approaches are used in a study to investigate a complex research problem. It is a research technique in which the researcher gathers and analyses data, mixes the outcomes and makes conclusions utilising both qualitative and quantitative approaches in a single study (Creswell & Creswell 2018). Hence, in this research, the researcher made use of both the qualitative and quantitative approaches to gather data on the utilisation of AIT for the management of records at the CSIR. The researcher used the qualitative method to collect data from the portfolio manager and records manager in the form of interviews because, as management team, they were expected to provide more information regarding the organisation and the managerial issues. The quantitative method was used to collect data from professional repositories and indexers, archives technicians and data librarian because they were expected to provide operational related information. The researcher decided to use the pragmatism perspective in selecting the mixed methods strategy for the purpose of this study, as it is generally connected with it (Babbie 2013; Creswell 2014; Creswell & Creswell 2018).

A mixed methods study is suitable for intricate research problems encompassing many aspects or individuals and circumstantial features that cannot entirely be addressed by utilising a single technique (Creswell & Creswell 2018; Ngulube 2020a). Creswell and Plano-Clark (2011); Leedy and Ormrod (2015) define mixed approaches as a mixed methods research strategy with theoretical perceptions as well as approaches of inquiry. As a procedure, it encompasses theoretical perceptions that lead the course of the gathering and interpretation of data and the combination of qualitative and quantitative data in a single or categorisation of research studies (Tashakkori & Teddlie 2003; Babbie 2013).

Mixed methods research is the kind of a study in which a scholar or group of scholars mix techniques of the qualitative and quantitative research methods (utilisation of qualitative and quantitative perspective, data gathering, analysis, interpretation methods) for the purpose of the extent of comprehending and justification (Creswell & Plano-Clark 2018). Mixed methods research is a procedure for engaging in investigation that encompasses collecting and mixing quantitative (descriptive, reviews, statistics) and qualitative (focus groups, interviews) research methods (Creswell 2014; Saunders et al. 2016). This method makes it possible for the researcher to advance the comprehension and validation in breadth and depth, while counteracting the weaknesses intrinsic in utilising each technique by itself (Bless, Higson-Smith & Sithole 2013; Leedy & Ormrod 2015). One of the most beneficial characteristics of engaging in a mixed methods research is the probability of triangulation, which refers to the utilisation of numerous means (methods and data sources) to scrutinise the phenomenon (Morgan 2019).

However, the researcher did not intend to triangulate methods in this study, because Morgan (2019) and Ngulube (2020a) profess that triangulation is no longer a legitimate mixed methods research technique and strategy. Triangulation measures a similar perception by making use of two or more approaches (Miller 2006; Kadushin, Hecht, Sasson & Saxe 2008). Indictors of the concepts are first collected in each method, and the underlying or latent concept is measured within each method (Kadushin et al. 2008; Johnson & Christensen 2014). The researcher opted for the mixed methods approach because the topic of this study is too broad and cuts across multiple disciplines, which include records management, AI, mechanical engineering and computer science. As such, the identified problem of this study was complex and could not be researched using a single research approach. However, there was the possibility of using qualitative methods due to the quantity of the population, but the researcher opted for the mixed methods approach due to the complexity and the nature of the problem and to get a holistic and comprehensive picture, as mixed methods research enhances the qualitative data. Therefore, based on those reasoning, mixed methods research was adopted in this study.

3.4   RESEARCH METHODS

Babbie (2013) and Maxwell (2013) indicate that research approaches are the several methods, algorithms and schemes used in research. Research methods refer to the approaches used by a researcher throughout a research study (Tracy 2013; Creswell & Creswell 2018). Research methods aim to find solutions to research problems (Hevner & Chatterjee 2010) and involve the procedure that is followed by the investigation (Babbie 2013). A research method is a strategy and measure for a research that extent the stages from comprehensive expectations to exhaustive approaches to data collection, analysis, presentation and interpretation (Creswell 2014). In systematic research, numerous research methods are used, such as quantitative and qualitative methods (Creswell 2014; Fidel 2012; Johnson & Christensen 2014; Ngulube 2015). However, the method assists the researcher in the establishment of a pure route about measures to be used in the research design (Creswell & Creswell 2018). For the purpose of this research, the researcher used the mixed methods research technique for data collection, analysis and interpretation (Bryman 2012; Creswell 2014; Ngulube 2015).

Furthermore, the research methods involve the population to be studied and designed, the data collection period, and reliability and validity procedures of the study (Bryman 2012; Rich, Brians, Manheim & Willnat 2018). This research study has deployed a convergent design to investigate the utilisation of AIT for the management of records. The convergent design was selected for the researcher to concurrently collect the qualitative and quantitative data from the participants, analyse it independently and mix the responses during data interpretation.

3.4.1   Convergent design

According to Creswell and Plano-Clark (2018), convergent design explains that the researcher simultaneously conducts the quantitative and qualitative fundamentals in the equivalent phase of the research process, considers the procedures, analyses the two elements autonomously and interprets the outcomes together. The aim of this design is to attain diverse but complementary data on the subject. This design outmoded the triangulation mixed methods research method and was previously

regarded as the concurrent or parallel design (Creswell & Plano-Clark 2018; Ngulube 2020a). In the convergent design, corresponding qualitative and quantitative data is gathered simultaneously to have a profound comprehension of the phenomena and for the purpose of validation, which refers to convergence, collaboration and divergence of the outcomes (Ngulube 2020a).

Therefore, quantitative outcomes can be demonstrated concurrently with qualitative outcomes (or vice versa) by utilising the convergent design. The two samples used for data gathering could mention the same or other people (Creswell & Plano-Clark 2018). The intent of the convergent design is to obtain dissimilar but equivalent data on a similar subject in order to best comprehend the problem of the research. The intent in using this design is also to convey the strengths and weaknesses of quantitative and qualitative approaches. This design is utilised when the researcher intends to contrast quantitative numerical outcomes with qualitative outcomes for a whole comprehension of the problem of the research (Creswell & Creswell 2018). Supplementary goals for this design comprise corroboration and validation goals demonstrating quantitative outcomes with qualitative outcomes (or vice versa) or investigative relations among variables by adding current variables founded on changed qualitative data into the associations (Bryman 2012).

The methodology for implementing a convergent design is via four major stages. In the first stage, the researcher gathers both quantitative and qualitative data about the interested topic (Creswell & Plano-Clark 2018). The gathering of these two kinds of data takes place simultaneous, but is typically detached from each other, which means they do not depend on each other. They have equal significance for resolving the research questions of the study (Creswell & Creswell 2018). In the second stage, the researcher analyses the two data sets separately and independently from each other through quantitative and qualitative analytic methods. During the third stage, the moment the two sets of initial outcomes are available, the researcher arrives at the point of interface and works to combine the outcomes of the two data sets (Leedy & Ormrod 2015; Creswell & Creswell 2018).

The integration might include comparing the diverse outcomes in a discussion, or it might include transforming outcomes to facilitate two kinds of data during added

analysis. In the last stage, the researcher interprets to what degree and in what methods the two sets of outcomes meet each other or deviate from each other and combine to form a better comprehension in response to the study's ultimate goal (Creswell 2014). If the outcomes deviate, the researcher should explain this deviation through re-examining the outcomes and gathering more data (Ngulube 2020a). In this study, both quantitative and qualitative data was collected separately and independently, and data was analysed and presented separately, but converged during the data interpretation phase.

3.4.2 Population

Polit and Hungler (2004); Bless et al. (2013) define a population as a collective and a whole of all the substances, topics or affiliates that imitate a group of stipulations. A population is explained as the group of all persons, items or data of interest (Bryman & Bell 2015; Taylor et al. 2016). Population is the group about which experts will make generalisations (Creswell 2014; Nayak & Sigh 2015). In this research, the population is the records management practitioners at the CSIR. Records management practitioners are accountable for the management of records. The records manager performs a strategic and executive role. The records management practitioners at the CSIR refers to the portfolio manager, records manager, professional repositories and indexers, and archives technicians. The records management practitioners provided their knowledge and expertise on the utilisation of AIT for the management of records. However, the population of this study consists of a sample size of eight, which was made up of one portfolio manager, one records manager, three professional repositories and indexers, two archives technicians and one data librarian to make the total of eight individuals at the CSIR. The sample size of eight in this study refers to the total population or representation of the study. They are based at the records management division at the CSIR.

3.4.3 Sampling method

A sampling method is a process for selecting sample members from a population. It is the procedure of selecting a representative cluster from the population under study (Leedy & Ormrod 2015). The sampling method illustrates the validity and reliability of

the research outcomes. It is a method of selecting members or a subset of the population to make numerical implications from them and predict the characteristics of the entire population (Babbie 2013). In this study, the researcher opted for a parallel sampling method to collect both the qualitative and quantitative data from the same population but using different samples. This means qualitative data was collected from records managers (portfolio manager and records manager) through interviews while quantitative data was collected from professional repositories and indexers, archives technicians and the data librarian through questionnaires.

3.4.3.1 Parallel sampling

Parallel sampling involves harvesting participants from similar populations, but each element of the study uses a dissimilar sample (Creswell & Plano-Clark 2018). A parallel relationship stipulates that samples for the qualitative and quantitative elements of the research are diverse but harvested from the same population of interest. This sampling technique entails two phases: one phase entails the quantitative phase and the other phase entails the qualitative phase (Creswell & Creswell 2018). In this sampling design, researchers have two or more parallel quantitative and qualitative strands – either with some minimal time interval or concurrently. The strand outcomes are integrated into meta-inferences after isolated analyses have been conducted, related quantitative and qualitative questions answered or aspects of the same mixed methods research question addressed (Schoonenboom & Johnson 2017). The qualitative and quantitative phases take simultaneously or with a small-time lapse between each phase. The two parallel phases are somewhat autonomous from each other.

One phase entails qualitative questions, data collection and data analysis, and the other phase entails quantitative questions, data collection and data analysis. The qualitative and quantitative phases are planned and carried out to answer different aspects of a core research question. Researchers draw inferences based on the data from each phase, and they mix their inferences from the qualitative and quantitative phases to make meta-inferences (Teddlie & Tashakkori 2009). In this study, interviews were conducted with a portfolio manager and a records manager to collect qualitative data. These two were the management in the information and knowledge management

division. Document analysis was also used to collect qualitative data. System analysis was used as a lens to collect qualitative data. Questionnaires were administered to three professional repositories and indexers, two archives technicians and one data librarian to collect quantitative data.

3.5   DATA COLLECTION TECHNIQUES

Data collection is the technique of gathering and evaluating information on directed variables in an identified systematic fashion, which then permits one to answer pertinent questions and evaluate the outcomes (Peersman 2014; Hepburn & Bolden 2017; Flick 2018). As part of data collection process, workshops were conducted. The workshop proceedings were regarded as data and were highly considered during data analysis and interpretation. Data was also collected through focus group discussions, interviews, document analysis, observation and administering questionnaires. System analysis was used as a lens to analyse and evaluate the current records management system. The following subthemes present more details about each of the data collection tools.

3.5.1   Questionnaire

Questionnaires are simple to generate, and this is why they are used by most scholars (Boynton 2004; Bless et al. 2013). Jones, Baxter and Khanduja (2013); Silverman (2017) suggest that the concept 'questionnaire' could be explained as a research tool used to collect data in the method of statistics. However, in most cases, it is also used to ask some open-ended questions or questions that need some clarification to partakers. Questionnaires were disseminated to all the records management practitioners, except the records manager and the portfolio manager, at the CSIR. Questionnaires were also sent to respondents via email who submitted them the same way after completing. Questionnaires were sent via email due to the covid-19 restrictions in South Africa at the time. A questionnaire is a research tool containing a sequence of questions for the purpose of collecting information from the responses (Mouton 2002; Silverman 2017).

The reason for choosing the questionnaire was to allow the respondents to answer questions about their views on and understanding of the utilisation of AIT for the management of records at the CSIR. According to Leedy and Ormrod (2013); Eckerdal and Hagstrom (2017) a questionnaire is made up of two kinds of questions, namely closed-ended questions and open-ended questions. Questions that can be answered with either a single word or a short expression are closed-ended questions, whereas open-ended questions permit the respondents to provide a more detailed answer to a certain question (Hagström 2015; Flick 2018). This study used a questionnaire to collect quantitative data from the records management practitioners (see Appendix 5).

3.5.2 Focus group

Bless et al. (2013) define a focus group as a marginal number of people, brought together as a conversation or resource group, which is more appreciated than any presentative sample. Such a group, discussing collectively their experiences of life and searching into it as they encounter one another's variances, will do much more to lift the shrouds casing the compass of life than any other device (Flick 2018). Focus groups are one of the most common qualitative research methods applied across the globe (Peersman 2014; Nyumba, Wilson, Derrick & Mukherjee 2018). It is a structured procedure of gathering a small group of individuals together for a collaborative, informal and unstructured discussion on a specific topic or perception (Nayak & Sigh 2015). A focus group commonly includes six to 12 participants and can bring about an enormous collection of information (Hepburn & Bolden 2017). The duration of a focus group can vary from one to three hours and it is usually conducted in an amiable surrounding such as a hotel or professional focus group research vicinity (Creswell & Plano-Clark 2018).

In this study, a group of eight participants was brought together on Microsoft Teams® to have a focus group discussion in the form of a workshop. The eight participants make up the same group that completed questionnaires and participated in the interviews. The portfolio manager and records manager participated in the interviews while professional repositories and indexers, archives technicians and the data librarian completed the questionnaires. Workshops took place on Microsoft Teams® due to the covid-19 restrictions in South Africa. In order to achieve the purpose of this

tool, the researcher organised two phases of the workshops. The first phase was to ensure that the participants have a similar understanding as the researcher, as far as AIT and its application in records management are concerned. The outcomes of the workshop assisted the researcher to develop and perfect the data collection instrument that was used to collect data in this study. The second phase of the workshop was to ensure that the researcher covered all the gaps that had not been covered in the first phase of the workshop. During the second phase of the workshop, the researcher managed to respond also to follow-up questions that were posed during the first phase.

3.5.3 Interviews

Babbie (2013) defines interview survey as one of the alternate approaches to gathering survey data. Krathwohl (2009) views interviewing to be a forthright procedure of swapping questions and answers among the interviewer and interviewee, during which the interviewer is the driver of the procedure. An interview can be described as the method through which the researcher organises and starts direct special contact with the respondents, with the expectation that the interviewee would answer questions asked by the interviewer during the data gathering interface (Bless et al. 2013). According to Nayak and Sigh (2015), interviews are referred to as a verbal questionnaire by another individual, but it is certainly sentimentality more than that. The records manager and portfolio manager were interviewed with a structured interview after the focus group participation with the rest of sampled population. The interview was conducted on Microsoft Teams® due to covid-19 restrictions in South Africa.

A structured interview is a type of interview in which the interviewer asks a specific set of prearranged questions. In structured interviews, questions are planned and created in advance, which means that all participants are asked similar questions in a similar order (Denzin & Lincoln 2018). Structured interviews could take 30 minutes to 2 hours and have the potential to collect adequate information. A special characteristic of this technique is that the interviewer has adequate opportunity to investigate the participants and collect adequate data (Dimitriadis 2016). The interviewer could make use of the responses granted by participants and convert them into connected questions approving a more comprehensive answer (Leavy 2017). In this study, both

the portfolio manager and the records manager were asked the same questions in the same order in order to ensure that adequate information is collected. This study used a structured interview to collect qualitative data (see Appendix 6).

3.5.4 Document analysis

According to Bowen (2009); Bruce and Bruce (2017), document analysis is described as a method of qualitative research in which records are construed by the researcher to give a voice and a sense around the investigated topic. Analysing documents integrates coding content into topics identical to how focus group or interview transcriptions are analysed (Bowen 2009). Document analysis is a methodical process for studying or assessing both paper-based and electronic records (Sutton 2015; Denzin & Lincoln 2018). Document analysis involves scrutinising the documents and then construing it to elicit meaning, obtain comprehension and establish pragmatic knowledge (Corbin & Strauss 2008; Austin & Sutton 2014). Documents encompass writing and pictures that have been documented without a researcher's involvement (Creswell 2014; Yin 2018). Documents analysis is about reviewing the created files of the institution that are accessible with the focal persistence of understanding the content and information enclosed (Ritchie & Lewis 2003). Bernard (2013) refers to document analysis as archival research in which archived records are considered.

Document analysis was used to analyse information in the guidelines, measures, values, reports and other pertinent records, as suggested by Creswell (2014). The researcher used a descriptive coding and classification scheme to critically analyse the current records management policy document used to manage records. Descriptive coding is a technique of coding that includes reading through qualitative data and coding passages based on the subjects (Saldana 2009). The researcher was guided by the manner in which the policy document addresses the creation, use, maintenance, storage and disposal of records. The other critical indicator was how the adoption of information technology for the management of records was infused in the policy document. The documents that are analysed in this research was the CSIR's records management policy, which is a legal framework the CSIR uses to manage their records. The researcher investigated issues related to how records are created,

how they are processed, captured, maintained, stored, retrieved and disposed of. It is through analysing the legal framework that the researcher saw how the CSIR manages its records. This study used document analysis to collect qualitative data (see Appendix 7).

3.5.5 Observation

Ritchie and Lewis (2003) define that observation is the data collection method in which the researcher is personally viewing the proceedings, activities and experience without any interference from the population or the organisation of the research. Creswell and Plano-Clark (2018) and Creswell and Creswell (2018) underline that observation as a data gathering tool requires methodical arrangement that includes the question of which matters should be observed and how to perceive them. The observation data recording could also be methodical, neutral and standardised via conservation of appropriate control and recording capabilities (Bless et al. 2013; Bruce & Bruce 2017). The researcher observed how records are created, processed, shelved and digitised into the current records management system at the CSIR. The researcher further observed how records are retrieved, accessed and disposed of. The time that records management practitioners spend on locating records and providing services to the clients was also observed. Throughout the whole observation, the researcher wanted to identify which records activities could be managed through AIT. The researcher used observation to collect qualitative data (see Appendix 9).

3.6 ANALYSIS OF THE CURRENT RECORDS MANAGEMENT SYSTEM

The researcher made use of system analysis as a lens to analyse and evaluate the current records management system. The system analysis variable emerges from the OAES theory. Livari, Parsons and Wand (2006) explain system analysis is the procedure to investigate a system, recognise problems and use the information to recommend enhancements to the system or a new system all together. System analysis is conducted with the aim of studying and evaluating a system or its objectives in order to recognise its objectives. It is a problem-solving method that improves the system and makes sure that all the elements of the system work proficiently to achieve their aim (Ramakrishnan 2012). It is used through information technology, where

computer-based systems need a well-defined analysis of their makeup and design (Gregor 2006; Rigat & Smith 2009). In this study, the researcher analysed the functions of the current records management system at the CSIR. This helped the researcher find out what the challenges of the current records management system were. Using this, the researcher would be able to recommend the record management functions that could be managed through AIT. The current records management system was also analysed to examine how records are created, processed, captured, accessed and disposed of through the system (see Appendix 8).

3.7   DATA ANALYSIS AND PRESENTATION

Data analysis is the way in which data would be analysed. Data analysis is a time-consuming and problematic method as the researcher collects a huge volume of field transcripts, interview records, audio proceedings, video data, replications or information from records, all of which should be scrutinised and construed (Leech & Onwuegbuzie 2008; Flick 2018). Leech and Onwuegbuzie (2008); Babbie (2013) further state that data analysis comprises dipping and organising the data, synthesising, probing for important patters, and realising what is significant.

Since the researcher opted for mix methods research, the methods of data analysis were also multitype mixed analysis. Johnson and Christensen (2014) define the multitype mixed analysis as an analysis of both types of data (qualitative and quantitative data) using both types of analysis, including the data display strategy of analysing data. However, in this study, the researcher used tables and figures to analyse the quantitative data of the study. For qualitative data, the researcher quoted the participants verbatim to analyse data, meaning the researcher quoted the participates word for word. The researcher also used the policy documents to analyse data. System analysis was used as a lens to analysis the current records management system at the CSIR.

According to Creswell (2014); Leedy and Ormrod (2015), the data display visually describes and depicts the researcher's quantitative and qualitative data. Table and graphs are used for quantitative analysis, interpretation and presentation; and graphs, charts, matrices, checklists, rubrics, networks and diagrams are used for qualitative

analysis, interpretation and presentation (Yin 2018). The researcher made use of both the qualitative data collection tools and quantitative collection tools and analysed and interpreted the data using mixed methods data analysis and interpretation tools (Allen 2016). The data analysis conducted and the presentation of data by means of tables, figures and descriptive analysis for quantitative data are supported by Ngulube (2005) and Creswell (2014). The researcher reached all this by means of two data analysis media: the profile medium to analyse the association of variables and proximity variables such as similarity and dissimilarity (Jason & Glenwick 2016). Moreover, this study also used a convergence of mixed methods in analysing data. This infers that the researcher collected quantitative and qualitative data separately an independently from each other. The quantitative and qualitative data was mixed during data presentation (Creswell & Creswell 2018). Among other things, the mix methods allowed the researcher to make sure that data is pure and that reviewed responses were authentic (Leavy 2017).

3.8   RELIABILITY AND VALIDITY OF THE STUDY

Reliability and validity play a vital role in instituting the reliability, credibility and truthfulness of results (Nayak & Sigh 2015). Therefore, this study observed all mixed methods research designs and procedures so that the research complies with the perception of validity and reliability to yield outcomes that are valid and reliable.

3.8.1 Reliability

Nayak and Sigh (2015) define reliability as concerns regarding the degree to which a research, test or any assessing procedure produces the same outcomes on recurring trials. Reliability is fundamentally an empirical issue, concentrating on the presentation of empirical measures (Creswell & Creswell 2018). Validity is concerned with the crucial relationship between concepts and variables (Taylor 2013). Mixed methods research is associated with the problem of legitimation, which refers to the credibility and reliability of the findings (Bandy 2007). The researcher ensured that when mixing approaches, meaning when applying both qualitative and quantitative methods, the subsequent findings and inferences were credible, trustworthy, dependable, transferable and conformable. In order to achieve credibility, trustworthiness and

dependability, the researcher ensured that the identity of the respondents and participants was kept confidential, that the quality of the data collection instrument was professionally enhanced and that both quantitative and qualitative data collection tools are used effectively and efficiently when collecting data. Mixed methods research also identifies the principle of complementary strength, which implies combining different methodologies and approaches in a numerous and creative ways (Leavy 2017).

3.8.2 Validity

Validity, on the other hand, is habitually more of a hypothetically oriented subject because it inescapably raises the question of for what purpose is it valid (Saris & Gallhofer 2007). As a result, the researcher guaranteed that those methods, procedures and strategies are confirmed to produce reliable and dependable conclusions by confirming that the research procedures satisfy the prerequisites of both the qualitative and quantitative approaches so that it succeeds in being a mixed methods research (Creswell & Plano-Clark 2018). The researcher ensured that the data collection tools such as questionnaires were provided to participants without errors and ambiguity. Questionnaires were collected immediately after participants completed them. During the interview, the researcher kept to the research questions and followed the checklist when analysing policy documents and the current record management system, and during observation. These helped the researcher to ensure validity and reliability to data collection tools during data collection.

3.9   ETHICAL CONSIDERATIONS

Ethical matters need to be perceived by researchers at all stages of the research (Ngulube 2015). The researcher must come up with a plan to deal with ethical matters as they occur during any phase of the investigation (Brewerton & Millward 2001; Creswell 2014). This is because social scientists, in particular, are expected to perceive the highest level of systematic and professional honesty (Terre Blanche et al. 2006). Like other scientific research, this investigation is guided by research ethics. This is because the researcher needs to be professional to produce excellence outcomes of the study. The information and data gathered for this investigation would be held confidential to that the participants'' names are not known and what they said

is not revealed to anyone. This is important because the participants then feel free to participate in a study without any fear or anxiety.

The researcher also adhered to the University of South Africa (Unisa) policy on research ethics (2013), which, among other things, needs the researcher to uphold the accountability towards those included in or affected by their research. Appendix 3 of this study is an ethical clearance letter offered by the Department of Information Science ensuring that the researcher adheres to the university's policies on research ethics. The researcher must also make sensible efforts to antedate and to guard against the unethical or unwanted or harmful outcomes of the investigation. The researchers should take sensible remedial steps when they encounter misuse or falsification of their work (Unisa Policy on Research Ethics 2013). The ethical issues professed by researchers encompass the protection of the rights of participants from victimisation, as well as their privacy and confidentiality, and obtaining informed consent (Mouton 2002). Furthermore, the study was performed in compliance with the Unisa research ethical guidelines and relevant policies and procedures, as outlined in the section on ethical consideration. The following Unisa documents were also used: procedures for studies for master's and doctoral degrees – part 1 of 2011, policy on research ethics of 2007, policy for master's and doctoral degrees of 2008, policy for copyright infringement and plagiarism of 2005, and language policy of 2010.

Participants were free to participate in the study. They were not being compelled, bribed or convinced into participation. Trustworthiness, objectivity and reliability were guiding values in this study (Leedy & Ormrod 2013). The researcher acquired authorisation from the CSIR to conduct the study and collect data. The request for permission to conduct a study at the CSIR was made in combination with Unisa and the research supervisor (Appendices 1 & 2). Appendix 1 is a letter to request approval from the CSIR for the researcher to conduct the study at the institution. Appendix 2 is a letter of approval from the CSIR permitting the researcher to conduct the study. Prior to signing consent forms, participants were told about the following: the purpose and objectives of the research, what is needed from the participants, the fact that participants would participate voluntarily and that they could withdraw at any time with no deleterious consequences. Furthermore, the researcher was cautious when quoting sources to circumvent fabricating and plagiarising the information attained

from various sources (Terre Blanche et al. 2006; Unisa 2007) since plagiarism and fabrication characterise unprincipled conduct on the part of the researcher (Coetzee 2003; Ngulube 2005; Unisa 2007).

3.10   EVALUATION OF THE RESEARCH METHODOLOGY

Creswell and Plano-Clark (2018) articulate that mixed methods research studies such as this one on the utilisation of AIT for the management of records at the CSIR in South Africa should be assessed on the origin of how qualitative and quantitative data was gathered, how both forms of data were deliberately mixed, how the study was introduced by a particular research design or method and how it was outlined by the theory and foundational expectations (Ngulube 2020b). This study was based on a pluralism ontological perspective and pragmatist epistemological perspective utilising a mixed methods research approach. The researcher opted for mixed methods research to ensure that both the quantitative and qualitative methods were used for the sake of comprehensiveness and to address the complexity of the problem to the best of the researcher's ability. The researcher adopted a convergent design in this study. Hence, the parallel sampling method was adopted to collect both qualitative and quantitative data. The method of data collection was initiated via a focus group (workshops), that was followed by document analysis, observation and interviews conducted to records managers. Questionnaires were administered to records management practitioners, except the records manager and portfolio manager. Workshops were conducted for all records management practitioners, including the records manager and portfolio manager, to educate them about the utilisation of AIT for the management of records from the researcher's point of view. Documents such as records management policies and legal frameworks were analysed.

3.11   SUMMARY OF THE CHAPTER

In short, this chapter charted the sketch towards the accomplishment or presentation of this research. The chapter deliberated the phases and functions accomplished during the research. Consequently, it informed the reader who has completed what, when and how? It is through this chapter that the researcher identified and deliberated the research paradigm, research methodology, research approach, population of the

study, sampling procedures, data gathering methods, and data analysis of the research study. Research methodology is a fundamental point of accomplishment for any methodical research, since the way in which researchers conduct their research controls the view of validity and reliability on the outcomes. For example, the methodical research with a non-representative sample may not be dependable or effective to readers and end-users of the findings and commendations. The population of the research also had to be relevant to the problem of the study, and the sampling method had to be appropriate to the type of population sampled. The ethical matters also had to be applied to evade unethical study consequences, bearing in mind matters connecting to appropriate referencing and credentials to evade plagiarism, informed consent from respondents and endorsement from the institution under the research. The next chapter presents the outcomes of the research based on the data gathered from the questionnaires, observation schedules, interviews and documents analysis.

CHAPTER 4

DATA ANALYSIS AND PRESENTATION OF THE FINDINGS

4.1   INTRODUCTION

The previous chapter provided a guideline for the research design and methodology applied in this study. These included methodological design and issues, research paradigm, research methodology and methods applied, sampling procedure followed, sampling frame applied, sampling size drawn from the whole population of the study and data collection techniques. This chapter provides data analysis and presentation of the outcomes of the study. In this regard, data is analysed in line with the objectives of the study. During data analysis, the researcher provided a proper description of how data was analysed to maintain transparency and credibility (Tracy 2013; Creswell & Creswell 2018). Data analysis is crucial for the research because it permits the study to enhance understanding, expand its theory and advance knowledge for the benefit of the readers (Babbie 2013). Babbie (2013) further contends that data analysis ensures that theories and concepts become explicit by organising specific details into a coherent picture or model.

The current researcher used the mixed methods approach to collect data and the same methods of convergence were applied to the same phenomenon to enhance the depth and breadth of the findings (Creswell & Plano Clark 2018). The chapter used figures and tables to simplify the information and make it presentable. The researcher used descriptive analysis for quantitative data and content analysis for qualitative data and presented quantitative and qualitative data convergently, but the data was integrated during the interpretation phase (Creswell & Plano-Clark 2018).

4.2   PERSONAL DATA

In this section, the study aimed to establish the age groups of the respondents, their gender, job titles and their highest qualifications. This assisted the researcher to establish whether respondents and participants were balanced in terms of these

categories. This was to ensure the study sample is representative of the whole population, based on those common variances.

4.2.1 Respondents per age group

The researcher requested the respondents through a questionnaire to provide their age groups on the scale provided, with the purpose of obtaining the age group ranges of the respondents. According to Figure 4.1, the outcomes from the respondents were reported as follows: three were in the age group 31-35, two were in the age group of 51-55 and one was in the age group of 56-60 years.
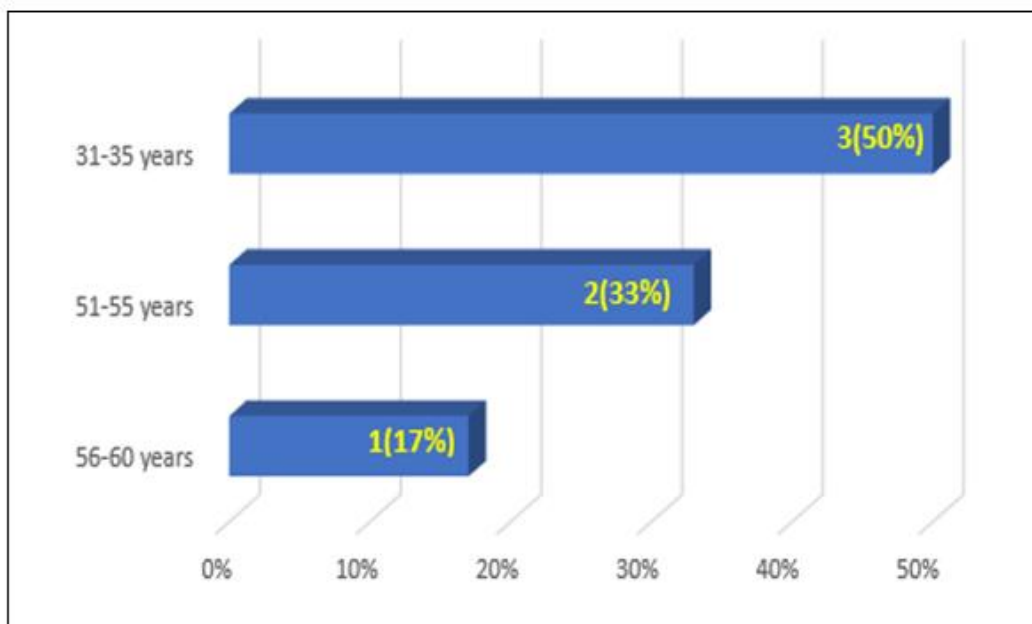
Figure 4.1: Respondents per age group (N=6)

Interviews were conducted with two participants. The following were the responses about their age group: Participant 1 stated that she was between the ages of 50 and 55 years and participant 2 stated she was between 36 and 40 years.

4.2.2 Respondents per gender

The sample was as follows: one respondent was male and five were female.

The interviews were also conducted with the management team in the knowledge management and information services portfolio. Two female managers were interviewed.

4.2.3 Respondents per job title

The study made provision for the establishment of respondents per job position. Figure 4.2 presents the outcomes of the research which were as follows: three respondents were professional repositories and indexers, and two respondents were archives technicians. Another one respondent who participated in the study was a data librarian.
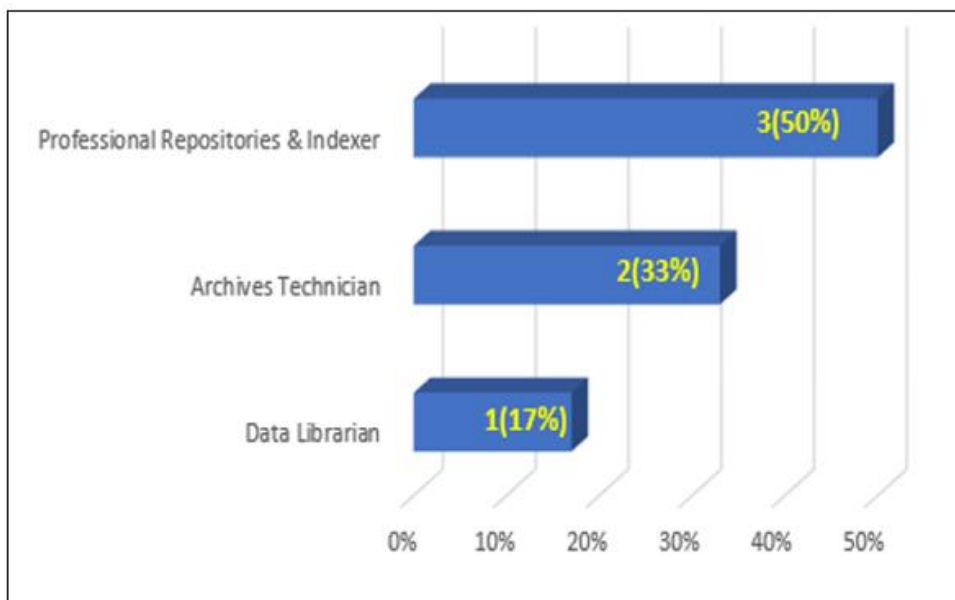
Figure 4.2: Respondents per job title (N=6)

While probing about their job titles, the two interview participants responded as follows: Participant 1 stated that "I am the manager: knowledge management and information services".
Participant 2 stated that "I am the manager: records management".

4.2.5 Respondents per qualifications

The study also identified the qualification level of respondents with the intention of identifying whether respondents were balanced according to the qualification levels.

The findings were as follows: two had degrees, three had honours degrees and one had a master's degree.
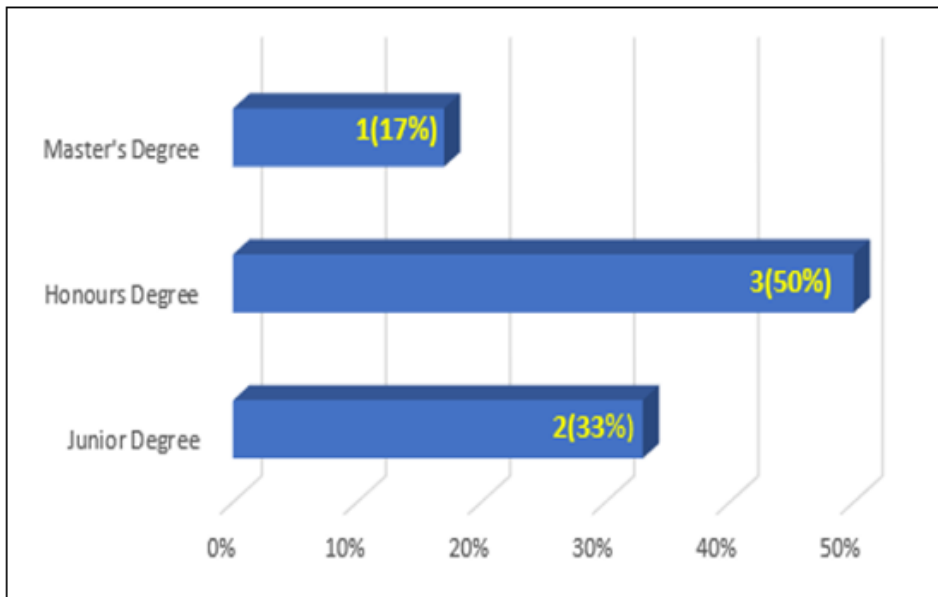
Figure 4.3: Respondents per qualifications (N=6)

Interview participants were also asked about their qualifications and they replied in the following manner:

Participant 1 stated that "I have a four-year library degree, which is equivalent to honours degree".
Participant 2 stated that "I have an honours degree in library and information science".

4.3   DATA PRESENTATION

This section presents data by addressing the objectives of the study.

4.3.1 State of records management at the CSIR

The first objective of this study was to "establish the state of records management at the CSIR". The intention was to establish this current state – whether good or bad. Respondents were also asked numerous questions through questionnaires and interviews to ensure that the research question regarding the state of records is addressed.

4.3.1.1 Format in which records are managed

There are various formats in which records can be managed. Based on this statement, the respondents were asked through a questionnaire about the format in which the records were managed at the CSIR. All six the respondents indicated that the records were managed at the CSIR in both manual and electronic format.

The respondents were also asked through the open-ended question in the questionnaire how effective the format was in which records were managed at the CSIR. Respondents indicated that the CSIR records management format was effective. The responses were as follows:

Respondents 1 stated that "It allows the records to be indexed and stored with location reference".

Respondents 2 stated that "It is moderately effective since manual records are sometimes hard to retrieve".

Respondents 3 stated that "Though it is effective, but the electronic records management system at CSIR still has challenges".

Respondent 4 stated that "Paper-based records are regarded as back-up records. Electronic records are easy to be retrieved".

Respondent 5 stated that "Electronic records can be retrieved anytime and anywhere through a computer or phone."

Respondent 6 did not answer the question.

The interview participants were also questioned about the format of records at the CSIR. Participants indicated that records at the CSIR were managed in a hybrid format, which means records were managed in both manual and electronic format. The following were the responses:

Participant 1 stated that "The format of records at CSIR is hybrid system, meaning it is both manual and electronic format and records are managed in both the electronic and manual format".

Participant 2 stated that "The format at CSIR uses both manual and electronic formats and the management of records is in both manual and electronic format".

The researcher observed that the format of records at the CSIR was a hybrid system. Records were in both manual and electronic format.

4.3.1.2 Records creation

Records are created in different formats in the organisations. In view of this statement, the respondents were asked how the CSIR created their records. One respondent indicated that the records were created in electronic format. Five of the respondents indicated that records at the CSIR were created both manually and electronically.

The respondents were also asked through the questionnaire about how effective records were created at CSIR. Respondents stated that the creation of records at CSIR was effective because records are created in both manual and electronic format and the responses were as follows:

Respondent 1 stated that "The creation of records is effective because records are created both in manual and electronic format".
Respondent 2 stated that "Manual records take a lot of space to store, therefore, records should be stored in the clouds".
Respondent 3 stated that "Electronic records management system is used properly unlike the manual system".
Respondent 4 stated that "Records that are created in electronic format are stored in the clouds".
Respondent 5 stated that "Paper-based records are not easy to retrieve but it is easy to retrieve electronic records".
Respondent 6 stated that "Both manual and electronic records are effectively created but it is easy to retrieve electronic records".

The interview participants were also asked how records were created at the CSIR. Participants indicated that records were created both manually and electronically at the CSIR. However, electronic records are more convenient than paper-based records. The responses were as follows:

Participant 1 stated that "Records are created both manually and electronically at CSIR, but electronic format is the most appropriate system".

Participant 2 stated that "Records are created in various formats, including paper-based and electronic format".

The observation report confirmed that records were created in both manual and electronic format. The CSIR's records were in both paper-based and electronic format.

4.3.1.3   Records storage

Organisations can store records through various storage methods. Based on this statement, the respondents were asked how records are stored at the CSIR. All six the respondents indicated that records were stored both physically on the shelves and electronically in the records management system.

The respondents were also asked through an open-ended question in the questionnaire whether the storage of records at the CSIR was effective and The respondents indicated that the storage facilities at the CSIR were effective and secured. Respondents replied as follows:

Respondent 1 stated that "It is very effective because once a record is created it is stored in the archives".

Respondent 2 stated that "It is effective however; it is not clear on how records are stored in different sections".

Respondent 3 stated that "Records are stored differently based on the sections".

Respondent 4 stated that "It is easy to retrieve electronic records because they are stored in the clouds".

Respondent 5 stated that "Records that are stored on the shelves and cabinet are not easy to be retrieved".

Respondent 6 did not respondent to the question.

The interview participants were also questioned how records are stored at the CSIR. Participants stated that records were stored in both electronic systems and physically on the shelfs and cabinets. The responses were as follows:

Participant 1 stated that "Records are stored in different applicable systems within the CSIR since they use hybrid systems, meaning records are stored both on the shelves and electronic records management system".

Participant 2 stated that "Records are stored in both physical and electronic storage. Physical storage refers to shelves and boxes in the archives and electronic storage refers to electronic records management system such as E-Procure and Microfocusvibes".

The researcher also observed that records were stored both on the shelves and in an ERMS.

The document analysis confirmed that the CSIR's records management policy indicated that electronic records were stored in the ERMS as listed in the file plan. The paper-based records with enduring value were transferred to the archives.

4.3.1.4   Accessibility of records by users

There are many methods in which the users can use to access the records in the organisation. Hence, the respondents were also questioned how records were accessed by the users at the CSIR. Five respondents indicated that the users accessed records either in person, telephonically or via emails. However, one respondent did not know how records are accessed.

Respondents stated that the users at the CSIR access records both manually and electronically using various methods. The following are the responses:

Respondent 1 stated that "The users access records via library blog".

Respondent 2 stated that "Records are accessed via the CSIR electronic records management system such as Microfocusvibes".

Respondent 3 stated that "Records are accessed physically on the shelves".

Respondent 4 stated that "Records can be accessed in both manual and electronic format".

Respondent 5 stated that "Records are accessed through databases".

Respondent 6 stated that "Records are accessed in the archives".

The respondents were also probed through an open-ended question in the questionnaire to indicate which methods of accessing records were effective at the CSIR. Respondents indicated that records could be effectively accessed via email, telephone and physically by visiting the archives. The responses were as follows:

Respondent 1 stated that "Telephonic and email method are effective to access records at CSIR".
Respondent 2 stated that "Email and physically visiting the archives is effective when accessing the records".
Respondent 3 stated that "Telephonic method is the most effective method to access the records".
Respondent 4 stated that "Going to the archives physically assist in accessing relevant records".
Respondent 5 stated that "Email, telephonic, and physically visiting the archives for records is effective when accessing records".
Respondent 6 stated that "Telephonic and email methods are the only effective methods to access the records".

The interview participants were also asked about the methods used to access records at the CSIR. Participants mentioned that records are accessed through internal systems or databases and the responses were as follows:

Participant 1 stated that "Records accessed through CSIR databases that includes both manual and electronic records".
Participant 2 stated indicated that "Records are accessed through CSIR internal database. However, only records that are classified would not be retrieved and records management practitioners must be contacted when accessing classified records".

The document analysis confirmed that the policy explicitly stated that the CSIR's records were not automatically in the public domain and the CSIR must, its own discretion, determine which records would be made publicly available.

4.3.1.5 Records retrieval

Organisations have various methods that the users can apply to retrieve records. Based on this statement the respondents were asked through the questionnaire how records were retrieved at the CSIR. Respondents stated that records can be retrieved both manually and electronically and their replies were as follows:

Respondent 1 stated that "Records are retrieved electronically via in-house databases".
Respondent 2 stated that "Paper-based records are retrieved by visiting the archives".
Respondent 3 stated that "Records are retrieved via the electronic management system such as Microfocusvibes".
Respondent 4 stated that "Records are retrieved both electronically and manually".
Respondent 5 stated that "Internal databases are used to retrieve records".
Respondent 6 did not answer the question.

The interview participants were also asked how records were retrieved at the CSIR. Participants stated that records were retrieved through internal databases and physically from the shelves and cabinets. Their responses were as follows:

Participant 1 stated that "Records are retrieved via the CSIR internal databases".
Participant 2 stated that "Records are retrieved on the shelves and the databases".

The observation reported that records were retrieved physically from the shelves. This was observed through visiting the archives.

The records management system analysis reported that the records are also retrieved electronically via an ERMS.

4.3.1.6 Period taken to retrieve records

Records can be retrieved at different times, depending on the type of record and where the records are stored. Hence, the respondents were also asked in the questionnaire about the time it takes to retrieve records at the CSIR. Figure 4.4 shows that two

respondents indicated that it took between 5 and 10 minutes to retrieve records, three indicated between 10 and 30 minutes, two indicated between 30 minutes and an hour and two indicated it took over an hour to retrieve records at the CSIR.
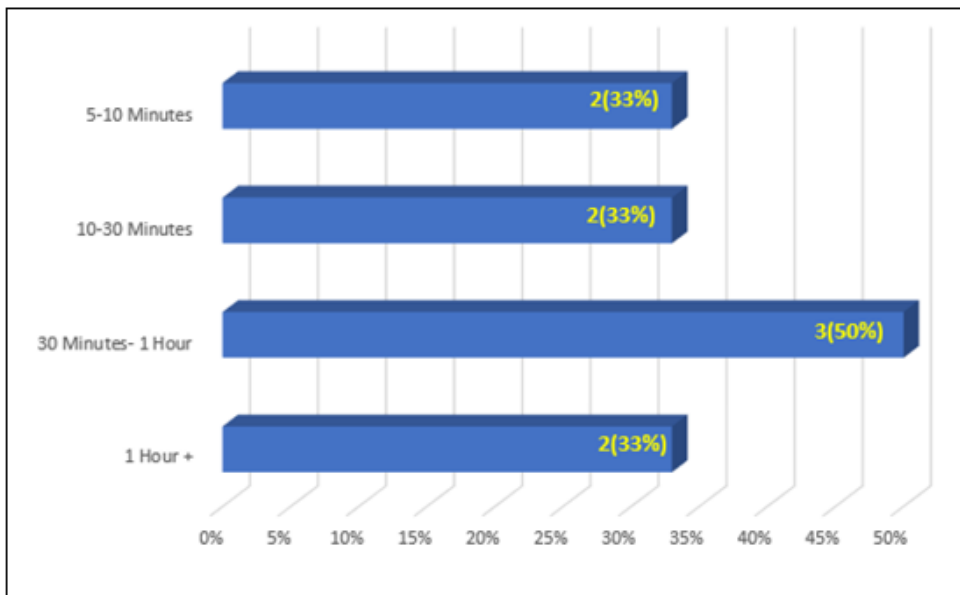
Figure 4.4: Period taken to retrieve records (N=6)

The interview participants were asked how long it takes to retrieve records at the CSIR. Participants indicated that it takes less time to retrieve electronic records than it takes to retrieve paper-based records. The responses were as follows:

Participant 1 stated that "Electronic records can be retrieved immediately but paper-based records can take time to retrieve depending where records are stored". Participant 2 stated that "It can take between 1-5 minutes to retrieve electronic records but a day or more to retrieve paper-based records".

4.3.1.7   Condition of records at the CSIR

Both paper-based and electronic records can either be in good or bad condition in the organisation. Based on this statement, the respondents were asked to describe the condition of records at the CSIR. Six respondents indicated that records at the CSIR were in good condition, while two respondents indicated that some of the paper-based records were not in good condition.

Respondents indicated that the CSIR's records were in good condition. The responses were as follows:

Respondent 1 stated that "Documents are filled in files to ensure they are in good condition".

Respondent 2 stated that "Records are not torn when shelved on the shelves or cabinet".

Respondent 3 stated that "Records are shelved on the shelves by their subjects so that they don't get scattered when retrieving them".

Respondent 4 stated that "Other records are shelved in the cabinets to ensure they are in good condition".

Respondent 5 stated that "Records are in good conditions".

Respondent 6 stated that "Some of the paper-based records are not in good condition".

The interview participants were also asked about the condition of records at the CSIR. Participants indicated that records were in good condition at the CSIR and their responses were as follows:

Participant 1 stated that "Records that are stored in formal archives are in good condition and electronic records are equally on good condition".
Participant 2 stated that "Both paper-based and electronic records are in good condition".

The researcher also observed the following: records that were stored in the archives were in good condition. Records were properly filed, and papers were not torn. Electronic records were also in good condition. Electronic files were not corrupted and were openable.

The respondents were also requested through the questionnaire to rate the current state of records at the CSIR. Table 4.1 shows that five respondents agreed that records were in a good condition, one respondent was unsure, and none disagreed. Three respondents agreed that records were well stored, none was unsure and two

disagreed that records were well stored. Two respondents agreed that records were easily accessible, three were unsure while one disagreed. Two respondents agreed that records were easily retrieved, three were unsure and one disagreed. Three respondents agreed that records were maintained, three were unsure and none disagreed. Two respondents agreed that records were easily disposed of, three were unsure and one disagreed. Four respondents agreed that records were safe and protected, two were unsure and none disagreed that records were safe and protected.

Table 4.1: The rate of current state of the CSIR's records management (N=6)

STATE OF RECORDS		RATINGS		
		AGREE	UNSURE	DISAGREE
Records are on good condition	No	5	1	0
Records are well stored	No	3	0	2
Records are easily accessible	No	2	3	1
Records are easily retrievable	No	2	3	1
Records are maintained	No	3	3	0
Records are easily disposed	No	2	3	1
Records are safe and protected	No	4	2	0

NOTE: No= Number

4.3.1.8   Records classification system applied at the CSIR

Organisations use different classification systems to arrange their records for easy access. Hence, the respondents were asked if they knew any classification system applied for the management of records at the CSIR. Five respondents indicated that they knew the classification system used for records management at the CSIR and one indicated that they did not know any classification system.

The interview participants were also asked how records were classified at the CSIR. Participants indicated that records were classified according to the CSIR file plan and through regulations stipulated in the NARSSA Act. The responses were as follows:

Participant 1 stated that "CSIR file plan is used to classify the records".
Participant 2 stated that "Records are classified according to the categories via the series provided by the national archives".

The respondents were also asked through the questionnaire about the nature of classification systems they used at the CSIR. Figure 4.5 shows that three respondents indicated that the CSIR used an alpha-numeric classification system, a numeric classification system and one respondent also said an alphabetical classification system was used.
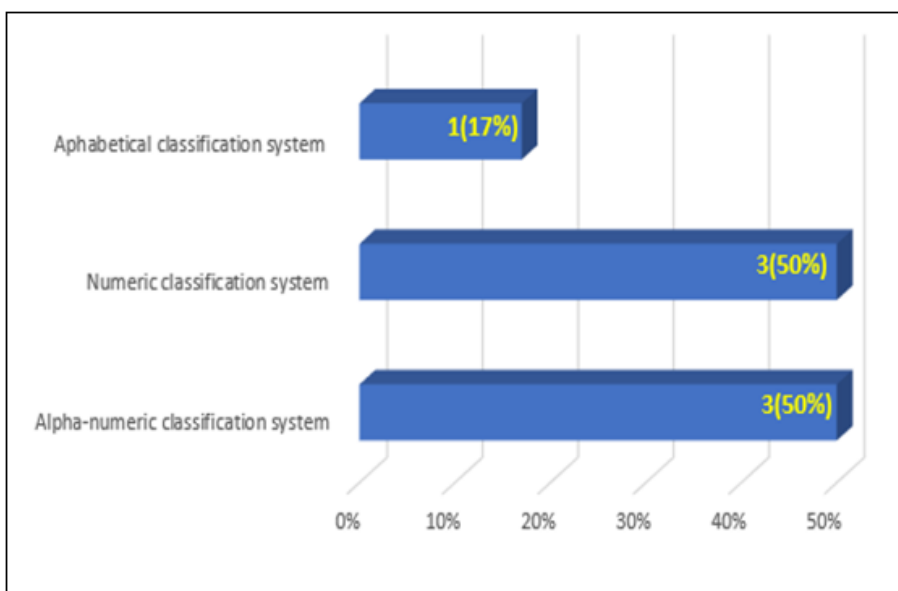
Figure 4.5: Nature of classification system used at CSIR (N=6)

The observation confirmed that records at the CSIR were classified according to an alpha-numeric classification system.

### 4.3.1.9	Records maintenance at the CSIR

Records are maintained to ensure that they remain in good condition and are easy to use. Based on this statement, the respondents were asked whether the CSIR maintained its records. Four respondents indicated that the CSIR did maintain its records while two indicated that they were unsure whether the CSIR maintained its records, and none indicated that it did not maintain them.

The interview participants were also asked how the CSIR maintained its records. Participants stated that electronic records were maintained by the CSIR ICT division and the paper-based records were maintained according to the CSIR's archival procedure. Their responses were as follows:

Participant 1 stated that "Records are maintained as per archival procedure and they are maintained to ensure effective accessibility of records".
Participant 2 stated that "Electronic records are maintained by ICT division and they follow the ICT policies".

The respondents were also asked through an open-ended question in the questionnaire to explain the nature of records maintenance at the CSIR. Respondents indicated that paper-based records were scanned and maintained electronically. The replies were as follows:

Respondent 1 stated that "CSIR scan old records into electronic system".
Respondent 2 stated that "The records are maintained by ICT department".
Respondent 3 stated that "Paper-based records are repaired when torn".
Respondent 4 stated that. "Torn up files are replaced with new ones".
Respondent 5 stated that "Electronic records are removed when they are destroyed".
Respondent 6 did not answer the question.

Through the document analysis report, it was found that the CSIR records management policy indicated that the CSIR must keep on upgrading their organisational systems and the migration of electronic records must be managed to ensure records remain retrievable, authentic and available when needed. The policy also outlined the responsibility for ICT on the maintenance and upgrading of organisational records management systems.

Respondents were also asked how often records were maintained at the CSIR. Three respondents indicated that records at the CSIR were maintained annually. Another three respondents indicated that records were maintained when there was a request and when records were torn.

Furthermore, the respondents indicated through the questionnaire the following responses to how often records were maintained at the CSIR:

Respondent 1 stated that "Records are maintained as per request".
Respondent 2 stated that "I am not sure when records are maintained at CSIR".
Respondent 3 stated that "Records are maintained when they are torn".
Respondent 4 stated that "Electronic records are removed when the file is corrupt".
Respondent 5 stated that "I don't know how records are maintained".
Respondent 6 did not answer the question.

4.3.1.10   Security measures for records at CSIR

Records can be protected by having security measures in place to secure the records against unauthorised access. Hence, the respondents were asked whether there were security measures in place at the CSIR for record protection. Five respondents indicated that there were effective security measures to protect records at the CSIR, while one respondent indicated they were unsure whether there were effective security measures. However, none of the respondents indicated there were no security measures to protect records at the CSIR.

The interview participants were also asked how records were secured at the CSIR. Participants mentioned that the CSIR's records were protected by the information

security policy. Participants indicated that electronic records were protected by security codes and encrypted passwords. They further stated that access to records storage facilities was under strict control access. The responses were as follows:

Participant 1 stated that "Records are secured by information security policy and records are also stored in the server for protection against unauthorised access to records".

Participant 2 stated that "Access to physical archives are strictly locked to monitor the access control and electronic records are secured by security codes and encrypted passwords".

The observation also reported the following: archives were always locked for strict control of access, electronic records were stored in the server for protection and passwords, and codes were required to access the records and the users fill in the register before accessing records.

The respondents were asked which kind of security measures were in place to protect records at the CSIR. Figure 4.6 illustrates that six respondents indicated that users completed a register before accessing records, three indicated that records offices were only accessible to records management practitioners and one indicated that the CSIR used a bibliometric system to access records.
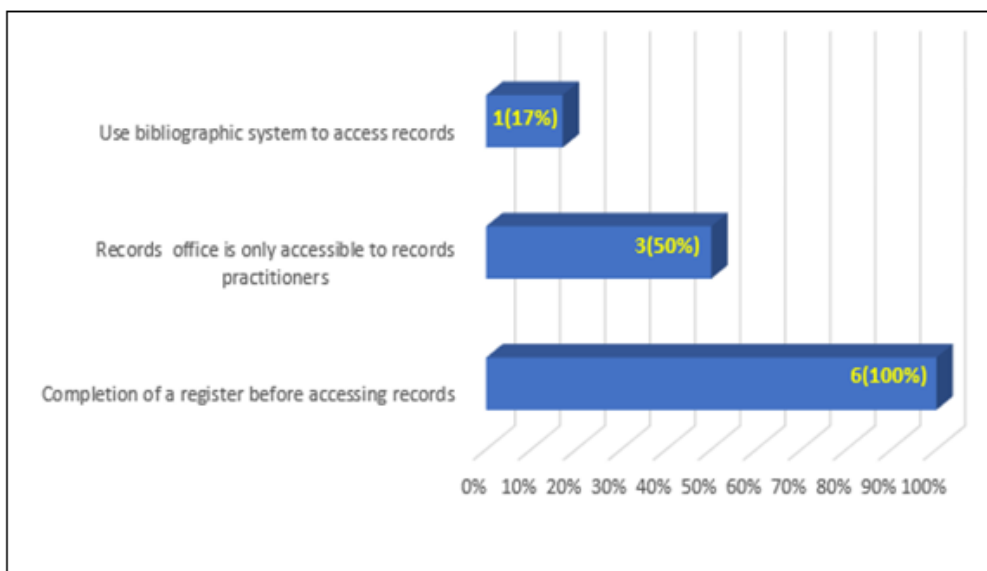
Figure 4.6: Kinds of security measures at the CSIR for records (N=6)

The interview participants were asked about the kinds of security measures in place to secure records at the CSIR. Participants indicated that there were security measures in place to ensure the safety of records. They also indicated that the registry was locked, and encrypted passwords were used to limit access to electronic records. The responses were as follows:

Participant 1 stated that "Archives are always locked and only records management practitioners have access to physical records".
Participant 2 stated that "Electronic records are protected with security codes and passwords to block unauthorised access to records".

The records management system analysis reports indicated that the system was secured as it was available within the firewall of the CSIR and it was accessed using your CSIR credentials.

4.3.1.11   Backup system for records at the CSIR

Organisations use more than one system to manage records so that when the main system malfunctions, another system can be used as a backup. Based on this statement, the respondents were asked if the CSIR had a backup system for records. Five respondents indicated that the CSIR did have a backup system for the management of records, one indicated they were unsure, while none indicated there was no backup system.

The interview participants were also asked if the CSIR had backup system for records management. Participants stated that the CSIR's records were backed up both manually and electronically. The responses were as follows:

Participant 1 stated that "Records are backed up on the clouds and electronic records management system at CSIR".
Participant 2 stated that "Copies of the records are kept at the archives for backup purposes".

The respondents were asked through open-ended questions in the questionnaire how records were backed up at the CSIR. Respondents mentioned that electronic records were backed up by copies that were stored in the archives. They also indicated that electronic records were backed up in the cloud storage at the CSIR. The replies were as follows:

Respondent 1 stated that "Records are backed up electronically and, on the clouds".

Respondent 2 stated that "Electronic records are backed up by manual copies stored in the archives".

Respondent 3 stated that "Electronic records are backed up in the electronic system management".

Respondent 4 stated that "Manual records are backed up in the archives".

Respondent 5 stated that "Records are backed up on the clouds storage".
Respondent 6 stated that "I don't know how records are backed up".

The records management system analysis report indicated that the ICT department did back up the system as per the CSIR's ICT and the information security policy procedures and protocols.

The researcher also observed that paper-based records are scanned and stored in the cloud for backup. Electronic records are also stored in the cloud as backup. The researcher also observed that the CSIR used organisational or internal cloud storage facility.

4.3.1.12   Disaster management plan for records at the CSIR

A disaster management plan exists to ensure that there are mitigation factors in place to protected records against natural disaster damages. Hence, the respondents were asked if there was a disaster management plan for records at the CSIR. Five respondents indicated that there was a disaster management plan for records at the CSIR, one indicated they were unsure, while none indicated that there was no disaster management plan for the management of records at the CSIR.

The respondents also indicated the following through an open-ended question in the questionnaire:

Respondent 1 stated that "CSIR disaster management plan also covers the management of records at CSIR".

Respondent 2 stated that "CSIR do have a disaster management plan".

Respondent 3 stated that "There is a disaster management plan for records management".

Respondent 4 stated that "CSIR consider the environmental safety of records so that they are not destroyed by natural disasters".

Respondent 5 stated that "There is a disaster management plan in place to ensure that records are protected against the light and water".

Respondent 6 stated that "I have no idea if there is a disaster management of records at CSIR".

The interview participants were also asked what the disaster management plan for records at the CSIR was. Participants stated that the CSIR had a disaster management plan because the organisation considers environmental safety of records to avoid records being damaged by disasters. The CSIR also had a disaster management policy that stipulated how the CSIR managed disasters. The responses were as follows:

Participant 1 stated that "CSIR consider environmental safety of records to avoid records being destroyed by things such as water and light".

Participant 2 stated that "CSIR records management policy also indicated that CSIR ensure the continued availability of and ease of access to records in the event of a disaster".

The document analysis report indicated that for the ICT system, the information security policy makes provision for processes of disaster management and recovery plan. The policy also refers to long-term preservation and disaster recovery procedures

for records. However, this was a new procedure and had not yet been approved by the time this research study was undertaken.

4.3.1.13   Disposal of records at the CSIR

Records that have no value are disposed of to create space for the records that still add value in the organisation. Furthermore, records that have reached the end of their life span are also disposed of based on the file plan and archival procedure. Hence, the respondents were asked through an open-ended question in the questionnaire how records were disposed of at the CSIR. Respondents indicated that records were disposed of through the CSIR file plan and the archival procedures. The replies were as follows:

Respondent 1 stated that "The archival records are disposed after retention period expired".

Respondent 2 stated that "CSIR hire a service provider to collect records that need to be disposed and the disposition of such records takes place safely".

Respondents 3 stated that "CSIR dispose the records according to CSIR file plan".

Respondent 4 stated that "CSIR records management policy also indicate that records at CSIR are disposed according to file plan".

Respondent 5 stated that "Records are disposed following the CSIR internal procedures such as the file plan".

Respondent 6 stated that "I don't know how records are disposed".

The document analysis report indicated that the policy refers to file plan and disposal authority for the disposal of records. The report also indicated that records that were due for destruction were deleted or disposed of as required. The disposal authority stipulated in the CSIR file plan serves as the guideline for decision-making.

4.4   POLICY AND LEGAL FRAMEWORK FOR THE MANAGEMENT OF RECORDS

One of the objectives of the study was to evaluate the records management legislative and policy framework applied at the CSIR. Several questions were posed to the respondents through questionnaires and interviews to answer this research question and to address this objective.

4.4.1   Application of records management legislative framework

Organisations use the legislative framework to provide guidance on the effective and efficient management of records. In view of this statement, the respondents were asked if the CSIR uses the legislative framework when managing records. All six the respondents indicated that the CSIR applied the records management legislative framework.

Participants indicated that the CSIR used the legislative framework to ensure its records were managed effectively and efficiently. The interview participants responded as follows:

Participant 1 stated that "CSIR use legislative framework for information governance, to ensure authenticity of records at all times and to ensure CSIR meet legal requirements for records retention and disposal".

Participant 2 stated that "CSIR uses legislative framework to ensure that CSIR as a public organisation comply with the national and international legislative framework and also for drafting and compiling the policy and strategic documents".

4.4.2   Electronic records management activities addressed by legislative framework

The legislative framework addresses various electronic records management activities in various ways. Based on this statement, the respondents were asked in the questionnaire about electronic records management activities addressed by the

legislative framework. The legislative framework at the CSIR was applied on discharging electronic records management activities, as indicated in Figure 4.7. Five respondents indicated that the legislative framework was used for the creation of records, six indicated they were used for the retrieval of records, five indicated they were used for the storage of records, five indicated they were used for records maintenance, and six indicated they were used for security and safety of records.
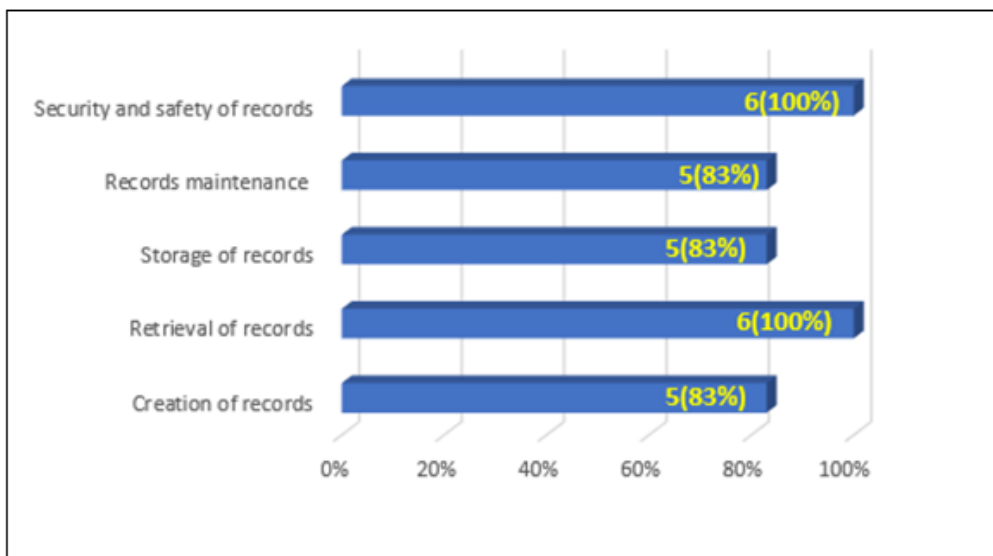
Figure 4.7: Electronic records activities addressed by legislative framework (N=6)

The interview participants were also asked about the application of a legislative framework in discharging activities to manage electronic records at the CSIR. Participants identified the legislative framework that is used at the CSIR for the management of records. Participants also indicated how the legislative framework was used to manage records effectively and efficiently. Participants responded as follows:

Participant 1 stated that "CSIR is a governmental body so it has to comply with the National Achieves and Records Service of South Africa Act to ensure CSIR achieve the principle of good management of records, for CSIR to perform its duties as specified in the Scientific Research Council Amendment Act and also ensure accountability, integrity and principles that comes with good records management".

Participant 2 stated that "Legislative framework used to guide the CSIR to comply with all the requirements to ensure there is good records management practice".

4.4.3 South Africa legislative framework used to manage records at CSIR

Organisations in South Africa make use of the legislative framework to manage their records effectively. Such legislative frameworks are used to provide guidance on how records should be managed. Hence, the respondents were requested in the questionnaire to identify the South African legislative framework that was used to manage records at the CSIR. Figure 4.8 reports that one respondent indicated that the CSIR used the Constitution, four indicated that they used PAIA, one confirmed that they used Promotion of Administrative Justice Act, No. 3 of 2000 (PAJA), five said they used the NARSSA Act, four indicated that they used the Protection of Information Act, No. 84 of 1982, five indicated that they used POPIA, and one said they used the ECTA.
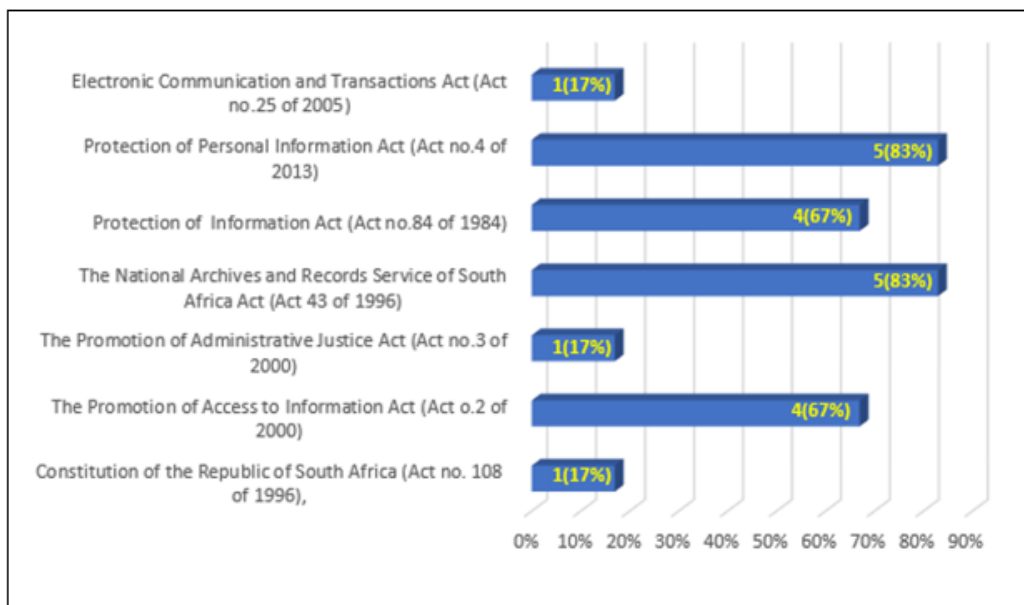
Figure 4.8: South African legislative framework used to manage records at CSIR (N=6)

The interview participants were asked about the South African legislative framework that was used at the CSIR for the management of records. Participants identified that the CSIR used the South African legislative framework for the management of records. The responses were as follows:

Participant 1 stated that the CSIR uses the following as legislative framework to manage records: The National Archives and Records Service of South Africa Act, No. 43 of 1996, the Promotion of Access to Information Act, No. 2 of 2000, the Protection

of Information Act, No. 84 of 1984, the Protection of Personal Information Act, No. 4 of 2013, the Electronic Communication and Transactions Act, No. 25 of 2005, the Scientific Research Council Amendment Act, No. 71 of 1990 and the Copyrights Act, No. 98 of 1978.

Participant 2 stated that: CSIR use the following legislative framework: The National Archives and Records Service of South Africa Act, no. 43 of 1996, the Promotion of Access to Information Act, no. 2 of 2000, the Protection of Information Act, no. 84 of 1984, the Protection of Personal Information Act, no 4 of 2013, the Electronic Communication and Transactions Act, 25 of 2005, the Scientific Research Council Amendment Act, no. 71 of 1990, the Copyrights Acts, no. 98 of 1987, the King IV report on corporative governance and the Spatial Data Infrastructure Act, no. 54 of 2003, as legislative framework to manage records .

4.4.4 Utilisation of legislative framework to manage records at CSIR

The legislative framework can be used to ensure that records are properly managed. Hence, the respondents were asked through questionnaires to indicate how the CISR applied the legislative framework for management of records. Figure 4.9 reports that four respondents indicated that the CSIR used the legislative framework for policy development, three indicated for decision-making, two highlighted for problem-solving, four for developing a records management framework, four for developing electronic systems and three indicated that the legislative framework was used to implement the training for staff on records management.
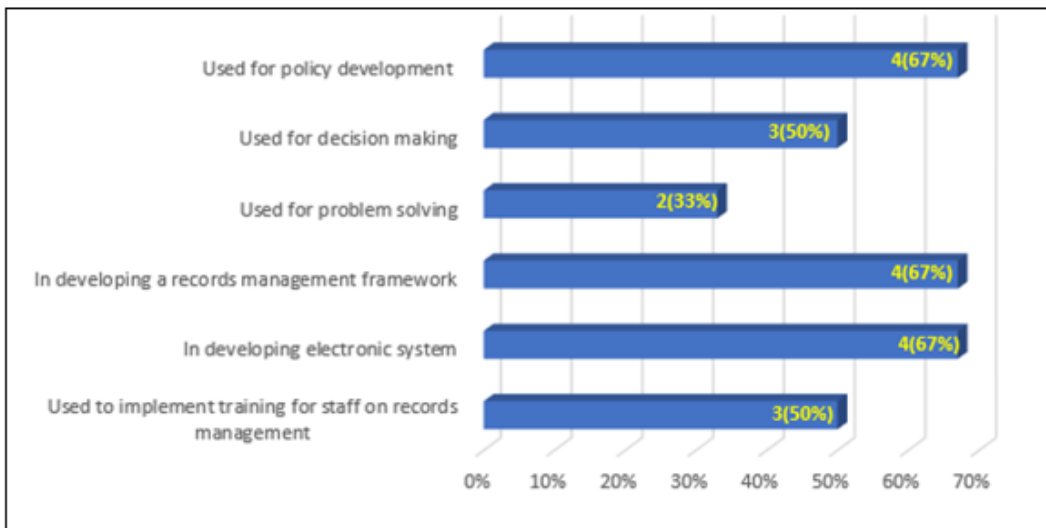
Figure 4.9: Utilisation of legislative framework for management of records at CSIR (N=6)

4.4.5 Gaps identified on the legislative framework for records management

There are gaps in the legislative framework that will obstruct organisations in giving guidance on how records should be managed in organisations. Based on this statement, the respondents were asked through the questionnaire (open-ended question) to describe the gaps in the legislative framework used at the CSIR. Some respondents indicated the gaps that they identified in the legislative framework used to manage records. However, others did not identify any gaps on the legislative framework. The responses were as follows:

Respondent 1 stated that "Policies are not compatible with electronic records management system".

Respondents 2 stated that "There is no enforceable and governance of legislations at CSIR".

Respondent 3 stated that "There is not compliance of legislations at CSIR".

Respondent 4 stated that "Policies do not cover effectively the electronic records".

Respondent 5 stated that "There is no gap in the legislation".

Respondent 6 stated that 'I am not certain about what can be added in the legislation".

The interview participants were also asked about the gaps in the legislative framework. Participants stated that no gap was identified in the legislative framework used to manage records. The responses were as follows:

Participant 1 stated that "There is no gaps on the legislative framework"
Participant 2 stated that "The legislative framework has no gaps".

4.4.6 Improvements to the legislative framework for records management

The legislative frameworks need to be improved regularly so that they it would provide effective guidance on the management of records in the organisations. Hence, the respondents were asked through an open-ended question in the questionnaire about the improvements needed to the legislative framework for records management. Respondents mentioned that the legislative framework should be improved to infuse the adoption of new ICT in the management of records. The responses were as follows:

Respondent 1 stated that "Legislative framework should include the investigation and adoption of a suitable electronic records management system".

Respondent 2 stated that "CSIR should conduct workshops about the legislative framework".

Respondent 3 stated that "CSIR should enforce compliance of legislative framework within the employees".

Respondent 4 stated that "I am not sure about the improvements that can be added on the legislative framework at CSIR".

Respondent 5 stated that "There is no improvement needed on the legislative framework".
Respondent 6 did not answer the question.

The interview participants were also asked about the improvement that could be made to the legislative framework. Participants indicated that there was no improvement

required to the current legislative framework since it covers all the critical components of records management in the country. The responses were as follows:

Participants 1 stated that "No improvement is needed on the legislative framework". Participant 2 stated that "The legislative framework needs no improvement".

Document analysis reported that the NARSSA Act does not address the adoption, implementation and utilisation of information technology in the management of records.

4.4.7 Availability of policy framework for records management

Policy framework is used to provide guidance on how to manage records in the organisations and assists the organisations to manage their records effectively. Based on this statement, the respondents were asked if there was a policy framework for the management of records at the CSIR. The outcomes show that all the six respondents indicated that CSIR had policy framework that was used to manage their records.

The interview participants were also requested to comment on how policy framework was applied at the CSIR. Participants stated that the policy framework governed the CSIR's records management activities such as the creation, storage, use, maintenance and disposal of records and they replied as follows:

Participant 1 stated that "The policy governs CSIR records activities so that records are reliable, authentic and accessible. The policy framework advises the organisation on the appropriate infrastructure, resources and processes that need to be in place so that data can be captured, and records disposed".

Participant 2 stated that "Policies are written in order to guide and governs CSIR since staff is required to comply with policies. The policies govern the efficient management of records at CSIR including all stages of records management such as the creation, use, access, maintenance and disposal of records. The policies govern and protect the confidentiality of CSIR records".

The document analysis reported on the following policies:

The CSIR's conditions of service dealt with the following: Working time: this guides the records management practitioners to develop turnaround time to provide a particular records management service. For example, how long it takes to retrieve a file on the shelves or in the system when requested by the users.

Training and development: this propel the CSIR to continuously provide developmental training to the records management practitioners. This helped the practitioners to provide effective records management services.

Policies: this guides the CSIR on how to manage and provide records management services effectively.

Security and privacy: this guide the CSIR on how records should be secured, and which records are regarded as confidentially and how such records could be retrieved when needed.

The CSIR's information security policy deals with the following: protection of information. This aspect of the policy ensures that the digital records are protected against illegal access and files are encrypted with firewall applications, passwords and security codes.

Backup and recovery: this deals with how electronic records are backed up through the ERMS and how deleted files are recovered in the cloud storage facilities. This policy guides the CSIR on how to store records on the clouds.

The CSIR's privacy policy deals with the confidentiality of personal information of their staff and the users of their services such as the researchers. Although the CSIR collects the information such as the IP address, browser and operating system information of users navigating through the website, such information would not be shared with the third party.

4.4.8 Policy framework used by the CSIR

The CSIR also has its own policy framework that is used to guide them on how to manage their records properly. Hence, the respondents were asked through questionnaires about the policy framework that was used to manage records at the CSIR. All six the respondents indicated that they used the CSIR's records management policy for the management of records.

The document analysis testified that the CSIR's records management policy covered the roles and responsibilities of the chief executive officer, CSIR management, the chief information officer and the records manager. The policy also explains the records management processes such as the records creation, maintenance, use, storage and disposal.

4.4.9 National policy framework used to develop the CSIR policy framework

Organisations in South Africa use the national policy framework to develop their institutional policy frameworks to manage their records. Based on this statement, the respondents were asked about the South African national archives and records management policies that the CSIR used to develop their own records management policy. Figure 4.10 reports that one respondent specified that the minimum information security standards policy was used to develop the CSIR's records management policy, one indicated the NARSSA records management policy manual was used, one indicated that the CSIR's privacy policy was also used to develop the CSIR's records management policy. One respondent was unsure which policies were used while five indicated that the NARSSA manages electronic records in governmental bodies: policy, principle and regulations were used to develop the CSIR's records management policy.
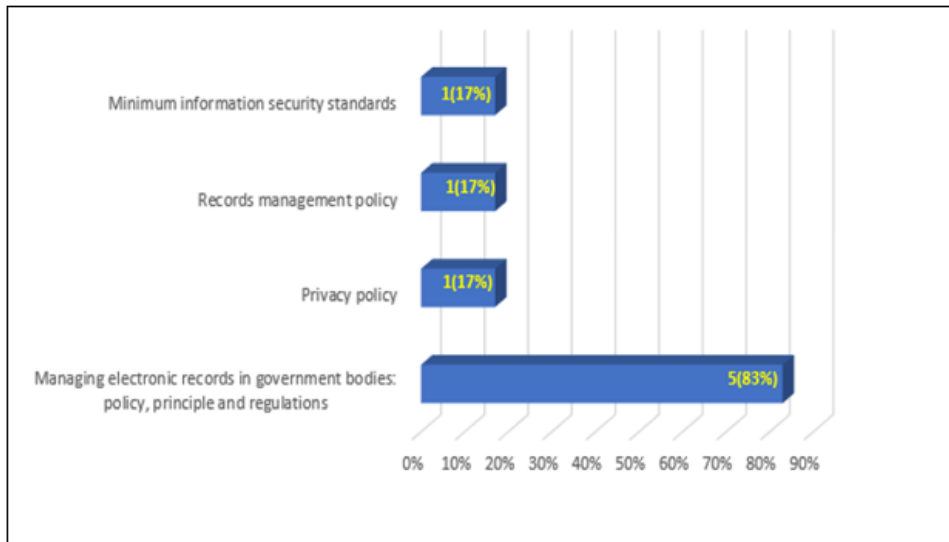
Figure 4.10: National policy framework used to develop CSIR policy framework (N=6)

The interview participants were also asked which policy was used by the CSIR to manage their records. Participants indicated that the CSIR used the CSIR records management policy to manage records effectively and efficiently. They responded as follows:

Participant 1 stated that "CSIR records management policy is used to manage records. The policy helps govern the effectiveness and efficiency of records management at CSIR, ensure good records management practice and ensure the integrity of records, long-term access and disposal of records".

Participant 2 stated that "CSIR records management policy is utilised to manage records at CSIR. The policy is used to govern and guide so that the staff has a clear direction on how things are done at CSIR and how CSIR require the staff to manage records, and also the policy protect the intellectual output of staff at CSIR. The policy also guides on access, use and disposal of records at CSIR".

The researcher observed that staff used the following policies to develop the CSIR's records management policy: the CSIR's conditions of services, information security policy, privacy policy and good research guide.

4.4.10 Records management activities covered in the CSIR policy framework

Policy framework can be used to provide guidance on how to manage different kinds of records management activities in an organisation. Hence, the respondents were asked to identify records management activities that were covered by the CSIR policy framework. Six respondents indicated that the CSIR records management policy covered the following records activities: receiving records, records preservation and conservation, records maintenance and use and records disposal.

The interview participants were also asked to indicate the records management activities that were covered by the CSIR's records policy framework. Participants identified the records management activities as follows: creation of records, use of records, records maintenance and disposal of records. Their responses were as follows:

Participant 1 stated that "The policy covers the creation of records, records maintenance, use and disposal of records".

Participant 2 stated that "The policy covers records activities such as records receiving, records conservation and disposition of records".

The document analysis confirmed that the following activities were covered in the CSIR's records management policy:

- Records creation and recipients: records are created in various formats, including paper and electronic formats. It is the responsibility of the record creator to ensure that records are complete, reliable, authentic and available for access and use. Employees creating documents must follow the document management procedure. Records received from external parties during the execution of the CSIR functions will be managed and retained in accordance with the file plan retention schedule.

- Records storage: electronic records are stored in relevant records management systems listed in the file plan. Transactional electronic records are managed within the applicable transactional systems and in accordance with the

prevailing system procedures. Security, privacy and confidentiality of electronic records are ensured as per the information security policy. Records in paper format with enduring value are transferred to the archives as soon as it is feasible to do so. Retention periods of records are determined in consultation with users and considering prevailing legislation, contractual commitments and organisational needs. Datasets are managed and stored according to the data management procedure.

- Records maintenance: the upgrading of organisational systems and the migration of electronic records must be managed appropriately to ensure that records remain retrievable, authentic and available when required. Long-term accessibility of records is ensured through the long-term preservation and disaster recovery procedure for records. Physical records are maintained as per the archive's procedure.

- Records access: the CSIR's records are not automatically in the public domain, and the CSIR, at its own discretion, determines which records will be made publicly available. Specific guidelines regarding requests for information are contained in the PAIA Manual, which is maintained by the DIO and/or his/her delegated authority. Confidentiality and non-disclosure clauses, as specified in the CSIR's conditions of service, apply. Only authorised staff may disclose CSIR records that are not in the public domain. The DIO will authorise appropriate staff members to disclose records that contain personal information of any member of staff of the CSIR, when necessary. Authorisation to disclose other records will be obtained through the CSIR records manager who will consult applicable management structures. Records are shielded against unauthorised access and tampering to protect their authenticity and reliability as evidence of the business of the CSIR.

- Records disposition: disposition of records comprises archiving, as well as destruction of records. The CSIR has established its own physical archives on the Pretoria premises and consequently no archival records are transferred to the National Archives of South Africa. Records that are due for destruction will be deleted or disposed of as required. The disposal authority stipulated in the CSIR file plan serves as the guideline for decision-making.

4.4.11 Gaps in policy framework for records management

Policies can have gaps that will hamper organisations in the proper management of their records. Hence, the respondents were asked through an open-ended question in the questionnaire if there were gaps in the CSIR policy framework. Respondents indicated that the policy framework did not cover the use of ERMS for effective management of records. Respondents further stated that there was no full compliance with the policy when managing records. The responses were as follows:

Respondent 1 stated that "There is no full compliance of policies within organisation".

Respondent 2 stated that "The policy does not fully cover the section of electronic records management".

Respondent 3 stated that "The policy does not cover effectively the use of effective electronic document management system at CSIR".

Respondent 4 stated that "The policy so far covered everything needed to be covered".

Respondent 5 stated that "There are no gaps in the current policy".

Respondent 6 stated that "I don't know if there is a gap in the current policy".

The interview participants were also requested to identify the gaps in the current CSIR records management policy. Participants indicated that the records management policy covered all the critical components of records management at the CSIR as the policy had just been reviewed recently. Participants replied as follows:

Participants 1 stated that "All the gaps have been addressed since their current policy has just be revised".

Participant 2 stated that "The policy is addressing everything that need to be addressed at CSIR".

The document analysis reported that the CSIR records management policy did not cover the management of electronic records and the use of information technology for the management of records.

4.4.12 Improvement on the CSIR policy framework for records management

Some of the policy frameworks need to improve to include critical aspects of records management functions. Hence, the respondents were asked through an open-ended question in the questionnaire if the CSIR policy framework needed improvements. Respondents stated that the CSIR policy should be executed effectively and fully. The following were the responses:

Respondent 1 stated that "The policy should address the full compliance within the organisation".

Respondent 2 stated that "The staff need to ensure that they apply the policy effectively and efficiently".

Respondent 3 stated that "The policy should allow the records management practitioners to identify and use effective and efficient electronic document management system".

Respondent 4 stated that "The policy needs no improvement, but it should be enforced".

Respondent 5 stated that "The current policy was just amended, so there is no need for the improvement".

Respondent 6 stated that "I don't know where the policy can be improved".

The interview participants were also requested to comment on how the CSIR policy framework can be improved. Participants mentioned that the only challenge the CSIR faced with regard to the policy framework was the implementation. They indicated that the CSIR's records management practitioners are hesitant to execute the policy. Their responses were as follows:

Participant 1 stated that "The only improvement needed is the execution of the policy at CSIR to ensure records are effectively managed".

Participant 2 stated that "The policy must just be fully implemented to ensure that the records are effectively managed".

4.5   ARTIFICAL INTELLIGENCE INFRASTRUCTURE

Another objective of the study was to identify the AIT infrastructure readiness for the management of records at CSIR in South Africa. Several questions were asked to the participants to address this objective of the study.

4.5.1   Artificial intelligence infrastructure for records management

There is AI infrastructure that can be used to manage records effectively and efficiently. Based on this statement, respondents were asked if they knew AI infrastructure to be used to manage records. Two respondents indicated that they had not known the AI infrastructure that can be used to manage records at the CSIR until the workshop, while four indicated that they had not known them even after the workshop.

The interview participants were also asked if they knew the AI infrastructure that can be used to manage records. Participants indicated that they knew some of the AI infrastructure that can be utilised to manage records effectively and efficiently. Participants further identified the AI infrastructure that can be used to manage records. The responses were as follows:

Participant 1 stated that "I know AI infrastructure such as automated classification and indicated that that will assist with auto classification of new records".
Participant 2 stated that "I know the AI infrastructure such as automated rules and indicated that it can help to control and assist with accuracy and speed when request for records has been made".

Respondents were also asked in the questionnaire about which AI infrastructures were suitable for the management of records that respondents were aware of. One respondent indicated that they knew deep learning as one AI infrastructure that can be used to manage records and one respondent indicated that they knew natural language processing. One respondent further added oracle as one AI infrastructure that can be used to manage records.

The respondents were asked through an open-ended question in the questionnaire if they knew AI infrastructure that can be used to manage records. Respondents indicated that they do not know AI infrastructure that can be used to manage records. The responses were as follows:

Respondent 1 stated that "I don't know any AI infrastructure that can be used to manage records".

Respondent 2 stated that "I have to attend workshops on AI so that I can know about it".

Respondent 3 stated that "I have to conduct a proper research on AI infrastructures that can be used for the management of records at CSIR so that I can know about it".

Respondent 4 stated that "I know nothing about the AI infrastructure that can be used to manage records".

Respondent 5 stated that "I know robots and automated classification that can be used to manage records".

Respondents 6 stated that "I don't know anything about AI infrastructure that can be used to manage records".

The observation confirmed that the records management practitioners were not aware of the AI infrastructure that can be used to manage records. However, the management was aware of some of the AI infrastructure such as automated classification that can be used to manage records.

4.5.2 Rating of artificial intelligence infrastructure effectiveness in the records management

The respondents were asked whether they either agreed, were unsure or disagreed with statements on the effectiveness of AI infrastructure used for records management at the CSIR. One respondent agreed that the AI infrastructure was effective in the creation of records, three respondents were unsure and two disagreed. Four respondents agreed that AI infrastructure was effective in storing records, two were unsure and none disagreed. Three respondents agreed that AI infrastructure was

effective in records classification, three were unsure and none disagreed. Four respondents agreed that AI infrastructure was effective in records maintenance, two were unsure and none disagreed. Three respondents agreed that AI infrastructure provided effective records movement and security, three were unsure and none disagreed. Two respondents agreed that AI infrastructure is effective in disposing records, four were unsure and none disagreed.

Table 4.2: Effectiveness of artificial intelligence infrastructure for records management at the CSIR(N=6)

ARTIFICIAL INTELLIGENCE INFRASTRUCTURE FOR RECORDS MANAGEMENT		RATINGS		
		AGREE	UNSURE	DISAGREE
AI infrastructure is effective in records creation	No	1	3	2
AI infrastructure is effective in storing records	No	4	2	0
AI infrastructure is effective in records classification	No	3	3	0
AI infrastructure is effective in records maintenance	No	4	2	0
AI infrastructure provide effective records movement and security	No	3	3	0
AI infrastructure is effective in disposing records	No	2	4	0

NOTE: No = Number

The interview participants were also asked how the AI infrastructure can be used in general for the management of records. Participants indicated that AI infrastructure can be used to provide accurate, reliable and quicker outcomes in the records management hemisphere. Participants further alluded that AI infrastructure can be used for digitisation of records. Responses were as follows:

Participant 1 stated that "AI infrastructure are used because they are accurate, reliable and faster when performing activities".

Participant 2 stated that "AI infrastructure provide quality metadata and also accurate results for the provision of effective and efficient records management services".

The respondents were also asked to elaborate on the issue of effectiveness of AI infrastructure about records creation. Respondents indicated that the utilisation of AI infrastructure would be effective for the management of records. The following were the responses:

Respondent 1 stated that "AI infrastructure will do quality control during the creation of records".

Respondent 2 stated that "AI will also assist in reading data and AI infrastructure will monitor the movement of records and keep records save".

Respondent 3 stated that "Through AI records will be stored on the clouds and AI infrastructure will assist in the disposal of records at CSIR".

Respondent 4 stated that "AI infrastructure will be programmed to classify records".

Respondent 5 stated that "AI infrastructure will ensure that records are maintained".

Respondent 6 stated that "I don't know what AI infrastructure can do for records management".

4.5.3 Availability of electronic records management equipment

Organisations should have the relevant equipment to be able to manage their records effectively and efficiently. Hence, respondents were asked about the availability of electronic records management equipment that the CSIR had to manage records. Figure 4.11 reports that five respondents indicated that the CSIR had a database, five

indicated they had internet and five indicated they had servers. Six respondents indicated that the CSIR had network connectivity, five indicate they had a website, five indicated that the CSIR had computers and six indicated that the CSIR had computer equipment as electronic records management equipment used by the CSIR to manage records. None of the respondents indicated that there were no robotic machines for the management of records at the CSIR.
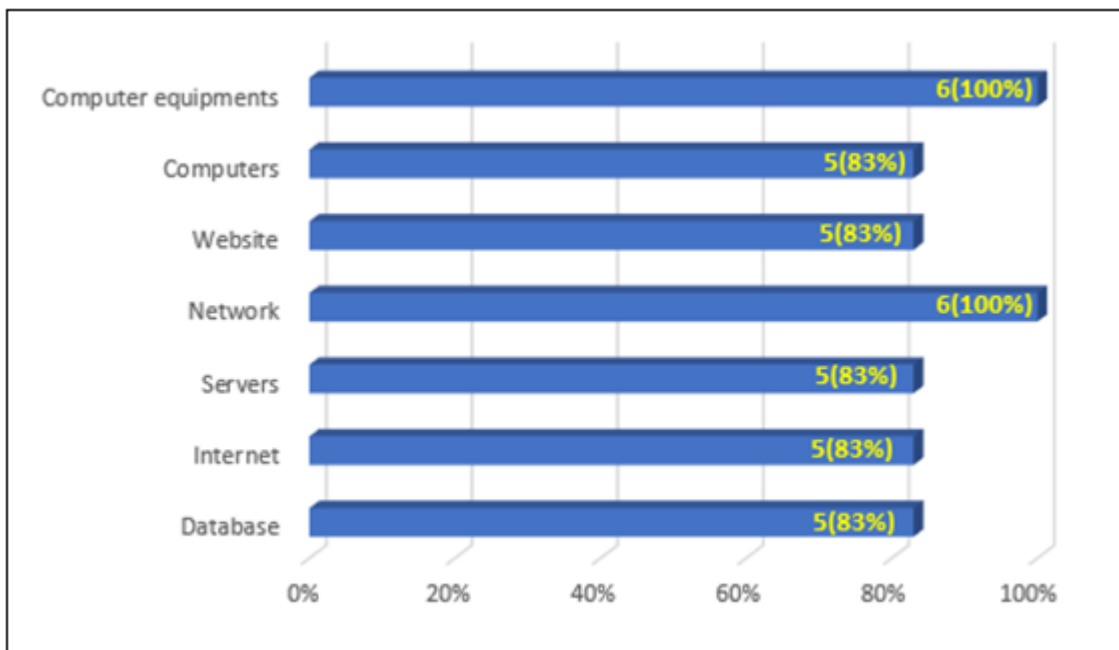
Figure 4.11: Electronic records management equipment for records management (N=6)

4.6 USABILITY OF ARTIFICIAL INTELLIGENCE TECHNOLOGY FOR RECORDS MANAGEMENT

Another objective of the study was to examine the usability of AIT for the management of records at the CSIR in South Africa. Several questions were asked to participants to address the objective.

4.6.1 Improvements of artificial intelligence technology for records management

The application of AIT has the capability to improve the records management services at the CSIR. Based on this statement, the respondents were asked about the

improvements that AIT can bring to the management of records at the CSIR. Table 4.3 presents the findings of the study. All six respondents agreed that through AIT, records will be managed effectively, one disagreed and none of the respondents were unsure. Five respondents agreed that AIT can provide reliable storage facility, three were unsure and one disagreed that AIT can provide reliable storage facility. Four respondents agreed that AIT can facilitate adequate records classification, five are unsure and none disagreed. Five respondents agreed that AIT can provide adequate maintenance of records, one was unsure and another one disagreed. Five respondents agreed that AIT provides adequate security and movement tracking of records, one was unsure, while one disagreed. Five respondents also agreed that AIT provides effective disposal of records, one was unsure and one disagreed.

Table 4.3 Artificial intelligence technology improvements on records management (N=6)

ARTIFICIAL INTELLIGENCE IMPROVEMENTS ON RECORDS MANAGEMENT		RATINGS		
		AGREE	UNSURE	DISAGREE
Records will be managed effectively	No	6	0	1
Provide reliable storage facility	No	5	3	1
Facilitate adequate records classification	No	4	5	0
Provide adequate maintenance of records	No	5	1	1
Provide adequate security and movement tracking of records	No	5	1	1
Provide effective disposal of records	No	5	1	1

NOTE: No= Number

The interview participants were asked to identify the improvements that AIT would bring to the management of records at the CSIR. Participants indicated that AIT can improve the digitisation process and quality of records, records would be retrieved faster and quicker, AIT has the cloud storage capacity and would assist in the maintenance of records. The following were the responses of the participants:

Participant 1 stated that "AIT captures data faster than HI, AIT retrieve records faster, has storage capacity and maintenance will be improved by flacking records that are corrupt".

Participant 2 stated that "AIT will automatically classify records, scan records faster and provide reliable access control".

4.7   RECORDS MANAGEMENT ACTIVITIES

Another objective of the study was to determine the records management activities that can be conducted through AIT at the CSIR in South Africa. Several questions on the records management activities were asked in order to address this objective.

4.7.1 The rate of the CSIR current records management activities

The respondents were asked to state whether they agreed, were unsure or disagreed with statements about the current records management activities at the CSIR. Table 4.4 presents the findings. Two respondents agreed that the CSIR had effective storage capacity, two were unsure and two disagreed. Four respondents agreed that the CSIR had effective retrieval capacity, one was unsure and one disagreed. Furthermore, five respondents agreed that the CSIR had effective records classification, one was unsure and none disagreed. Five respondents agreed that the CSIR had effective records access control and measurement, two were unsure and none disagreed. Three respondents agreed that the CSIR had reliable records movement tracking system, one was unsure and three disagreed. Four respondents agreed that the CSIR had records safety and security measures, three were unsure and one disagreed. Three respondents agreed that the CSIR had an effective disposal system, three were unsure and none disagreed.

Table 4.4: Rates of records management activities at the CSIR (N=6)

RECORDS MANAGEMENT ACTIVITIES		RATINGS		
		AGREE	UNSURE	DISAGREE
CSIR have effective storage capacity	No	2	2	2
CSIR have effective retrieval capacity	No	4	1	1
CSIR have reliable records backup system	No	5	1	0
CSIR have effective records classification system	No	5	1	0
CSIR have effective records access control measures	No	5	2	0
CISR have reliable records movement tracking system	No	3	1	3
CSIR have records safety and security measures	No	4	3	1
CSIR have effective disposal system	No	3	3	0

NOTE: No= Number

The interview participants were asked about the effectiveness of records management activities at the CSIR. Participants stated that the records management system at the CSIR was effective because it provided effective creation, storage, digitisation, maintenance and disposal of records. The responses were as follows:

Participant 1 stated that "The records management systems at CSIR provide effective storage, retrieval, use, maintenance and disposal of records at CSIR".

Participant 2 stated that "Records management system provides effective classification, digitisation and creation of records at CSIR".

The respondents were also requested to elaborate on their answers regarding the effectiveness of records management system at the CSIR. Respondents stated that the CSIR was effective in the storage capacity, retrieval of records, reliable back up of records, classification of records, safety and protection of records and records disposal.

On the issue of the CSIR having effective records storage capacity, the responses were as follows:

Respondent 1 stated that "There is a lot of records which are misplaced".

Respondent 2 stated that "Storage space is too small".

Respondent 3 stated that "Electronic records are effectively stored

Respondent 4 stated that "There is always a problem with paper-based records".

Respondent 5 stated that "Electronic storage is reliable than manual storage".

Respondent 6 stated that "I have no idea which one is more effective at the moment".

On the issue of the CSIR having effective records retrieval capacity, the responses were as follows:

Respondent 1 stated that "Most records are not captured in the system and it is difficult to retrieve them".

Respondent 2 stated that "Records are retrieved better via electronic records management system".

Respondent 3 stated that "Records that are stored digitally can be retrieved anytime and anywhere".

Respondent 4 stated that "Paper-based records are always misplaced".

Respondent 5 stated that "Paper-based records are always not easy to retrieve"

Respondents 6 stated that "It is easy to retrieve records electronically".

On the issue of the CSIR having a reliable backup system, the replies were as follows:

Respondent 1 stated that "Some records seem to be missing while they are not captured in the electronic records management system".

Respondent 2 stated that "there is effective electronic records management backup system".

Respondent 3 stated that "CSIR uses the archives to store paper records as back-up".

Respondent 4 stated that "CSIR does not have effective back up system since it uses many systems".

Respondent 5 state that "CSIR has a small space for back up".

Respondent 6 stated that "I have no idea if CSIR has back up for records".

On the issue of effective records classification, the responses were as follows:

Respondent 1 stated that "CSIR use alpha-numeric classification system which is an in-house classification system".

Respondent 2 stated that "CSIR also use a file plan classification system which is approved by the national archives".

Respondent 3 stated that "CSIR use alphabetical classification system".

Respondent 4 stated that "Alpha-numeric is the system used to classify records".

Respondent 5 stated that "a file plan is used to classify records at CSIR".

Respondent 6 stated that "I have no idea what is used to classify records at CSIR".

On the issue of records access and measurement, the responses were as follows:

Respondent 1 stated that "Only authorised staff have access to the archives".

Respondent 2 stated that "Security codes and passwords are used to access the electronic records".

Respondent 3 stated that "Microfocusvibes ensures that electronic records are tracked for their movements."

Respondent 4 stated that "Paper-based records are registered in the file plan register to ensure records are tracked for movement".

Respondent 5 stated that "Records are accessed both manually and electronically".

Respondent 6 stated that "CSIR use hybrid system to access records".

On the issue of effective records safety and security, the replies were as follows:

Respondent 1 stated that "Archives are protected by climate control and security measures".

Respondent 2 stated that records "Electronic records are safely secured by firewall applications".

Respondent 3 stated that "Archives are always locked, and access given only to staff".

Respondent 4 stated that "Electronic records are protected by passwords and security codes".

Respondent 5 stated that "Users register their names and the details of the file before taking it away".

Respondent 6 stated that "I don't know what is used to protect records at CSIR".

On the issue of effective records disposal system, the responses were as follows:

Respondent 1 stated that "The disposal of records at CSIR is guided by the CSIR file plan".

Respondent 2 stated that "File plan is used for records disposal".

Respondent 3 stated that "CSIR dispose its records via the file plan".

Respondent 4 stated that "CSIR is guided by a file plan on how to dispose the records".

Respondent 5 stated that "File plan guide CSIR on how to dispose its records".

Respondent 6 stated that "I have no idea on how records are disposed at CSIR".

4.7.2 Records management activities that may be discharged through artificial intelligence technology

AIT can be used to discharge some of the records management activities. Where necessary, AIT can also be used to perform all the records management activities. Hence, respondents were asked about the records management activities that can be discharged through AIT at the CSIR. Figure 4.12 presents the findings. Three respondents indicated that AIT can be used for records creation, six indicated it can be used for records retrieval and four indicated AIT can be used for records classification. Four respondents indicated that AIT can be used for records storage and four indicated that AIT can be used for records maintenance. Five respondents indicated that AIT can be used for records movement tracking and safety while four indicated AIT can be used for records disposal.
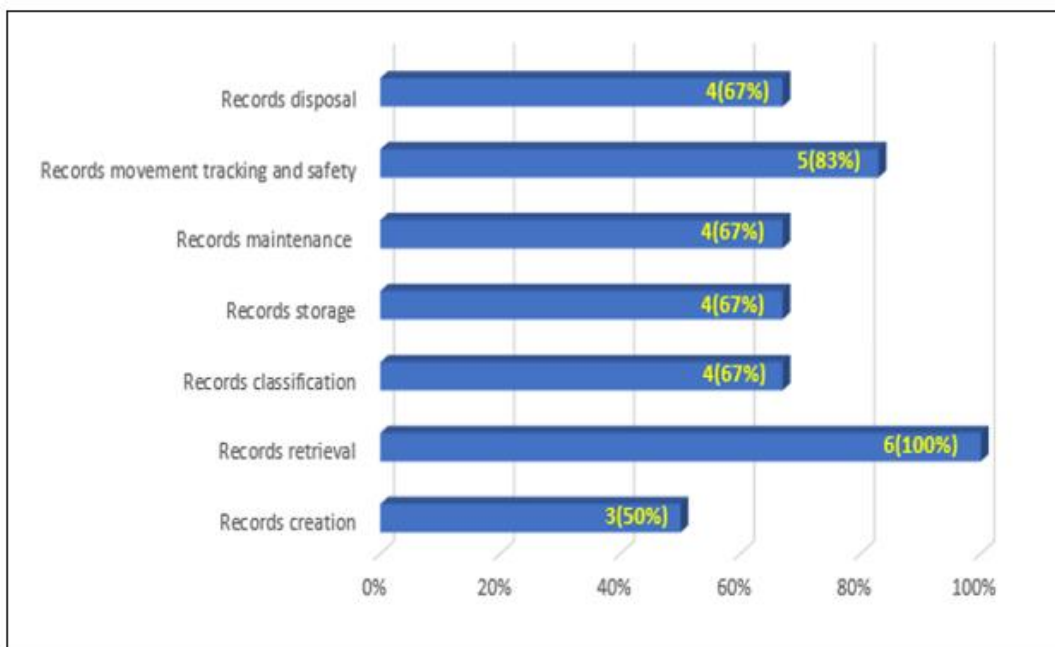
Figure 4.12: Records management activities managed through artificial intelligence technology (N=6)

The respondents were also queried through an open-ended question in the questionnaire about the records management activities that can be managed through AIT at the CSIR. Respondents indicated that AIT can be used for records creation, retrieval, maintenance, classification, storage and disposal and records tracking and safety. The responses were as follows:

Respondent 1 stated that "AIT can be used for records creation".

Respondent 2 stated that "AIT can also be used for records retrieval".

Respondent 3 stated that "AIT can also be used to maintain records".

Respondent 4 stated that "AIT can also be used for records classification".

Respondent 5 stated that "AIT can be used for records storage".

Respondent 6 stated that "AIT can be used for records tracking and safety".

The interview participants were also asked about records management activities that can be discharged through AIT at the CSIR. Participants indicated that the records management activities that can be managed through AIT include records creation, records maintenance, records retrieval and records disposal. They further stated that AIT can be used to classify and digitise records and to track the movement of records at the CSIR. The responses were as follows:

Participant 1 stated that "Records management activities such as records creation, records maintenance, records retrieval and disposal of records can be managed through AIT at CSIR".

Participants 2 stated that "AIT can be used to classify, digitise and track movement of records at CSIR".

4.8   USER UNDERSTADING AND PERCEPTION ON ARTIFICIAL INTELLIGENCE TECHNOLOGY FOR RECORDS MANAGEMENT

Another objective of the study was to examine the understanding and perception of records management practitioners regarding the use of AIT for managing records at the CSIR in South Africa. Several questions were posed to achieve the outcomes of the objective.

4.8.1 The meaning of artificial intelligence

AI can have various meanings based on the understanding of the users. Hence, the respondents were asked to indicate what they think AI refers to in their own words. Figure 4.13 presents the findings of the study. Six respondents indicated that AI was referred to robotic machines, four indicated it referred to cloud computing, four indicated it referred to blockchain technology, three indicated it referred to big data, four indicated it referred to internet of things and three indicated that AI referred to the web of things.
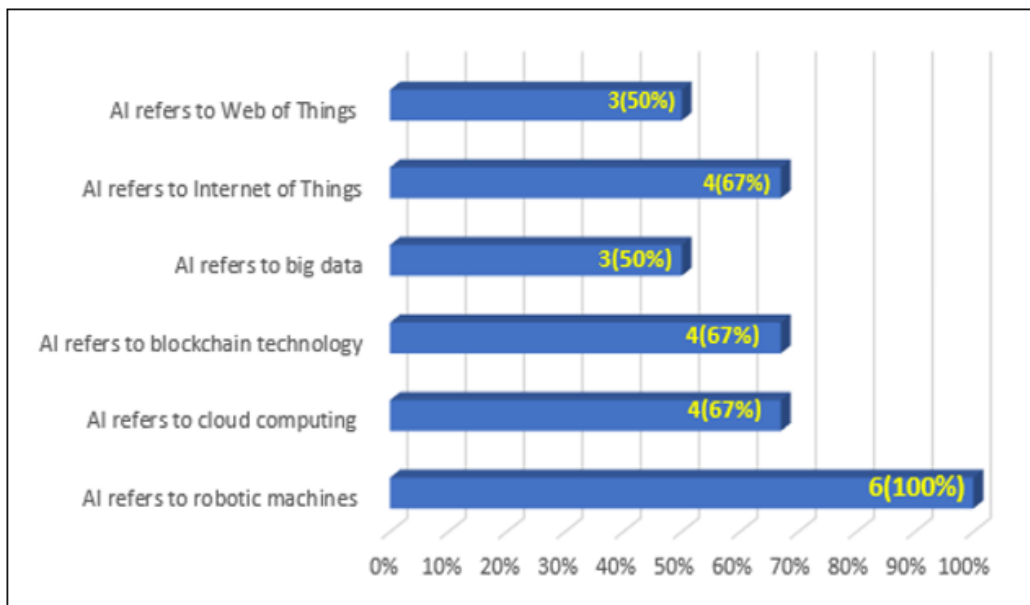
Figure 4.13: The meaning of artificial intelligence (N=6)

The interview participants were also asked to explain AI in their own words. Participants explained AI in different ways. AI was defined as an intelligent machine that has the ability to mimic human intelligence. It was also explained as AI technology that carries all human functions. It works for 24 hours and even in a dangerous and risky environment. The responses were as follows:

Participant 1 stated that "AI is a machine that can learn and interact with humans. AI intends to create intelligence machine that work and interact more like human. It uses algorithm, teach the machine to recognise patterns, learn from experience and keeps getting smarter".

Participant 2 stated that "AI is all technologies produced by machines to carry out all human functions and even do more. AI can work even for 24 hours. AI can even work at risky environment and can do more than what human beings do".

4.8.2 Familiarity with the application of artificial intelligence technology for records management

In order for the records management practitioners to apply AIT properly for the management of records, they should familiarise themselves with the application of AI for the management of records. The respondents were asked if they were familiar with the application of AIT for the management of records. Three respondents stated they were familiar with the application of AIT for the management of records, while three stated they were not familiar with the application of AIT for the management of records.

The interview participants were also asked if they were familiar with the application of AIT for the management of records. the participants stated that they were familiar with the application of AIT for the management of records. The responses were as follows:

Participant 1 stated that "The application of AIT will not only benefit the retrieval of records but it will also support the indexers, it will assign relevant metadata during capturing of records, it can handle big volume of records and it can be linked to different classification systems and controls for vocabularies and be able to automate the signing of metadata to records".

Participant 2 stated that "AIT enables the integration of systems, it can assist with automation and classification of content, it will assist in the improvement and automation of manual capturing of records, it will help in retrieving records and will read the content of documents. It will help in the scanning/digitising records and can work for 24/7 hours per day".

The respondents were also asked through the questionnaire about their understanding of the application of AIT for the management of records. Figure 4.14 presents the findings. Three respondents indicated that AIT manages records effectively, three

indicated that AIT provides retrieval of records, three indicated it stores records effectively and two indicated that AIT provides security for the records.
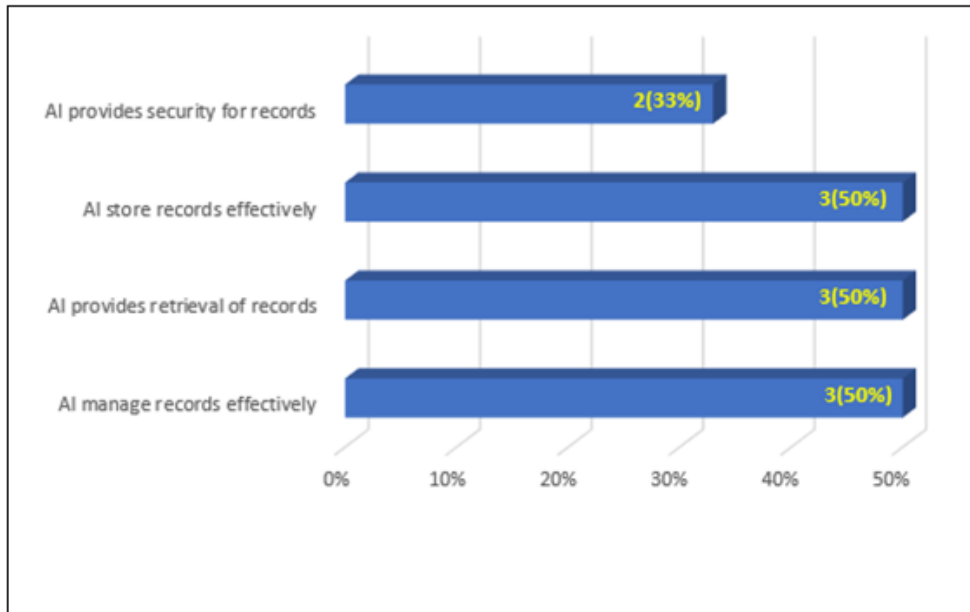
Figure 4.14: Understanding on the application of artificial intelligence (N=6)

The respondents were asked about their understanding of the application of AIT for the management of records. Figure 15 reports that three respondents had no understanding of the application and utilisation of AIT for the management of records. The respondents indicated that the following can be done for them to have a better understanding of the application of AIT for the management of records. Figure 4.16 presents the findings of the research. Four respondents indicated that for them to have an understanding of the application of AIT for records management they must attend workshops on AI, three indicated attending conferences on AI, four indicated attending trainings on AI, three indicated they should study AI, while two indicated writing papers on AIT for the management of records.
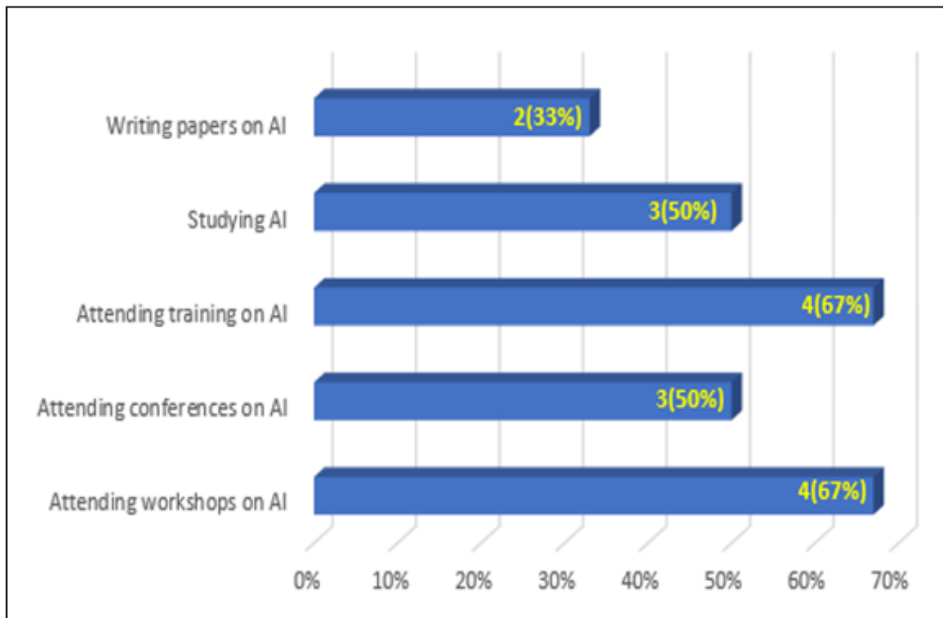
Figure 4.15: Mitigation on understanding the application of artificial intelligence (N=6)

4.8.3 Readiness to implement artificial intelligence technology for the management of records

In order for the organisation to implement AIT in the management of records, they must have the relevant resources that will enable them to implement AI properly. Based on this statement, the respondents were asked if the CSIR was ready to implement the AIT for management of records. All six the respondents indicated that the CSIR was not ready to implement the AIT for the management of records.

The interview participants were also asked about the state of readiness of the CSIR to utilise AIT for the management of records. Participants indicated that the CSIR was ready to implement the utilisation of AIT for the management of records. However, the participants also stated that at the time of the study, the CSIR had no resources to implement AIT. The following were the responses:

Participant 1 stated that "Even though CSIR have no resources to implement AIT but once they are required to implement it, they will ensure they implement".

Participant 2 stated that "CSIR needs relevant resources to ensure that AIT is effectively implemented to manage their records properly".

The respondents were also asked through an open-ended question in the questionnaire to indicate what the CSIR was doing to implement AIT for the management of records. The respondents stated that the CSIR was in the process of implementing AIT for the management of records. The replies were as follows:

Respondent 1 stated that "CSIR is busy conducting research on the possibility to implement AIT for the management of records".

Respondent 2 stated that "I am not aware of any plan CSIR have on the implementation of AIT for the management of records".

Respondent 3 stated that "Staff attend workshops that addresses AIT for the management of records".

Respondent 4 stated that "Staff collaborate with researchers on AIT for records management".

Respondent 5 stated that "I am not aware if CSIR is working on adopting AIT to manage records".

Respondent 6 stated that "I don't know what CSIR does to implement AIT for the management of records".

4.8.4 Improvements of records management services using artificial intelligence technology

The application of AIT has the potential to improve the management of records. Based on this statement, the respondents were asked about the improvement of records management services using AIT. Figure 4.16 presents the findings depicting that six respondents indicated that AIT will provide easy digitisation of records, five indicated that AIT will provide easy retrieval of records, five indicated effective storage of records and three indicated effective protection of records.
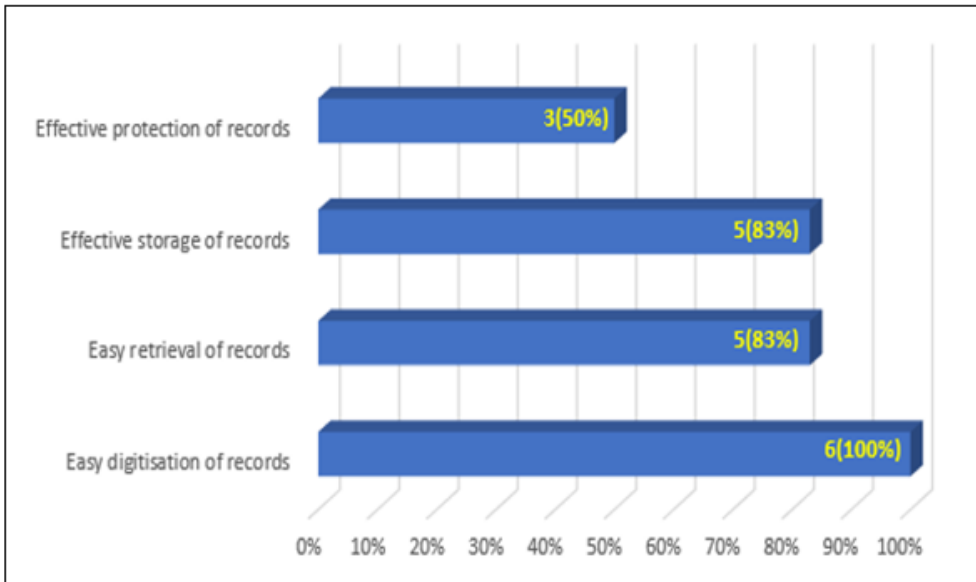
Figure 4.16: Improvement of records management activities through artificial intelligence (N=6)

The interview participants were asked about the improvement of records management services using AIT. The participants stated that the records management services would be improved when discharged through AIT. The responses were as follows:

Participant 1 stated that "AIT can be able to improve the current processes around records and rectify human errors committed as records are managed".

Participant 2 stated that "AIT can improve the integration of systems, disposal of records, retrieval of records and scanning of records".

4.8.5 Utilisation of artificial intelligence technology for records management

The respondents were asked to provide their general views about the utilisation of AIT for the management of records at the CSIR. Figure 4.17 presents the findings depicting that five respondents indicated that AIT would provide effective records management at the CSIR, three indicated that records will still not be effectively managed anyway and one indicated that records management practitioners will lose their jobs if AI is applied to manage records at the CSIR.
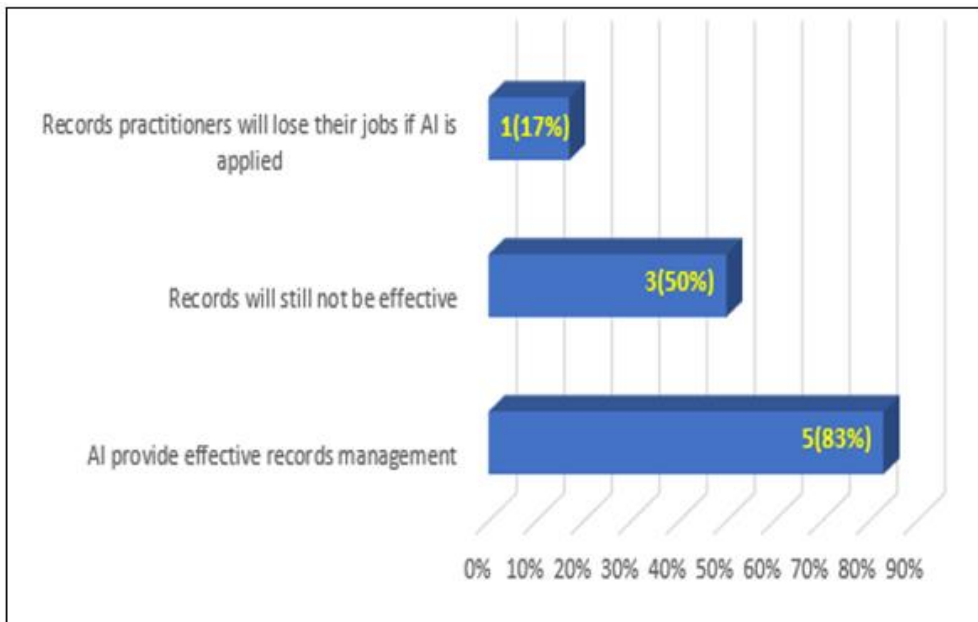
Figure 4.17: Utilisation of artificial intelligence for records management (N=6)

The interview participants were also asked about their general views of the application of AIT for the management of records. Participants indicated that the application of AIT for the management of records would enable the CSIR to manage the records effectively and effectively. The responses were as follows:

Participant 1 stated that "AI can bring improved accuracy in the management of records, contribute to time and cost savings, and assist in disposal of records".

Participant 2 stated that "AI will improve the management of records, help to capture a vast amount of data and help retrieve faster".

4.9   SUMMARY OF THE CHAPTER

This chapter presented the findings of the study from data collected using six different techniques, namely focus group workshop, questionnaires, focus group interviews, document analysis, system analysis and observation. Quantitative data was analysed independently and separately through tables, charts and graphs. Qualitative data was analysed through quoting the participants verbatim. The results were presented convergently in order to produce sound research outcomes. The data collected and presented was based on the objectives of the study. The findings of this study focused

on the legislative and policy framework used to manage records at the CSIR, the state of records management at the CSIR, records management activities that can be carried out through AIT at the CSIR, user perception about the application of AIT for the management of records at the CSIR and the usability of AI infrastructure for the management of records at the CSIR. Therefore, the next chapter provides the interpretation and discussion of the findings of the study as reported in this chapter with support from the literature review.

CHAPTER 5

INTERPRETATION AND DISCUSSION OF THE RESEARCH FINDINGS

5.1 INTRODUCTION

The previous chapter analysed and presented the outcomes of the study based on the objectives. This chapter covers the interpretation and discussion of the findings of the study from the data collected from the sampled participants (Babbie 2013; Creswell & Creswell 2018). The outcomes presented were interpreted and are discussed in this chapter for profound comprehension by the reader. This chapter interprets and discusses the findings based on the following themes emanating from the objectives:

- State of records management at the CSIR.
- Policy and legal framework for the management of records through AIT at the CSIR.
- AIT infrastructure readiness for the management of records at the CSIR.
- Usability of AIT for the management of records at the CSIR.
- Records management activities that can be carried out through AIT at the CSIR.
- Perception of records management practitioners regarding the usage of AIT for managing records at the CSIR.
- Framework on the utilisation of artificial intelligence for the management of records at the CSIR.

5.2 STATE OF RECORDS MANAGEMENT AT THE CSIR

The state of records management was investigated because the researcher had to determine if records at the CSIR were in a good or bad condition. Literature indicated that poor records management leads to records being stacked in various offices and it is difficult for users to access them (Tagbotor et al. 2015). Marutha (2021) and Tsabedze (2012) affirm that proper records management includes the development of proper controls and management in each phase of the record's life cycle and the records continuum model. Good records keeping saves time because there are no complications when they are retrieved, and the users are able to retrieve them easily and quickly (Keorapetse & Keakopa 2012). In order for the organisation to provide

quality records management services, they should ensure that their records are in a good condition. However, a bad state of records management would deter the quality of records management services that could be provided by organisations. Users would be unable to retrieve and use records without experiencing accessibility challenges because records would always be available in good condition. It is, therefore, the responsibility of the CSIR to ensure that their records are in good conditions before they make them available to the users with ease.

5.2.1 Format in which records are managed

Ngoepe and Marutha (2021) opine that records can be created and managed in manual and electronic format. Therefore, it is up to the organisation to determine in which format their records would be created. However, in most organisations, both in the private and public sector, records are created in both manual and electronic formats (Ji 2018). Nelson (2012) further suggests that having records created in both manual and electronic formats always enables the organisation to provide services, which would boast their service delivery. Six respondents stated that records in the CSIR were created and managed in both manual and electronic formats. It was easy to manage records and ensure that quality records management services are provided when they are created and managed in both manual and electronic format. Paper-based records were managed manually via the file plan that emanated from the NARSSA Act.

Electronic records were managed using ERMS and internal databases. Users continuously received services even when one of the systems was malfunctioning; for example, when the electronic management system was malfunctioning, the manual system was used to continue providing services. However, the respondents indicated that although the manual format allowed records to be stored with location reference, it was difficult to retrieve them on the shelves or cabinet. The respondents further indicated that it was also difficult to retrieve electronic records at the CSIR since many systems were used, such as E-Procure for human resource and financial records and Microfocusvibes for research records. Therefore, the CSIR might have to decide on the common system that can be used throughout the CSIR to ensure that only one ERMS was used to manage all the CSIR records. This would enable the CSIR records

to be managed at one central point and it would be easy for records management practitioners to manage their records effectively. The participants also indicated that the format of records at the CSIR was in hybrid format, meaning they were both in manual and electronic format.

5.2.2 Records creation

According to the literature reviewed, Franks (2018) explains that paper-based records could be created as soon as the first document pertinent to the record was created; however, there were records that were created electronically. According to Ji (2018), electronic records are records that were created in electronic format, such as emails, minutes of meetings, strategic plans and different kinds of reports that were produced electronically (Ngoepe & Marutha 2021). Therefore, organisations should decide to create records either manually or electronically. However, many organisations prefer to have their records created in both manual and electronic format because they serve as a backup for each other (Franks 2018; Ji 2018). Hence, the majority of the respondents (five) indicated that records at the CSIR were created both manually and electronically. It is a norm in many organisations that records were created in both manual and electronic format so that records could be always easily managed and retrieved.

Records were created in both manual and electronic format to ensure that they could be accessed and retrieved through various methods, for example, paper-based records were retrieved physically, and electronic records were retrieved via ERMS and databases. The participants and respondents further opined that records are created effectively at the CSIR because records were generated in both manual and electronic formats. However, the minority of one respondent indicated that records at the CSIR were only created electronically. Perhaps the respondents were referring to born-digital records, which refer to records such as emails, reports and minutes. The system analysis report also indicated that at the CSIR, records were created both manually and electronically.

5.2.3 Records storage

In the literature, Marutha (2021) pronounces that paper-based records were classified and stored on the shelves and in boxes, whether in the archives or records offices in both private and public organisations. Paper-based records were stored on the shelves for quicker and easy retrieval (Franks 2018). However, it takes more time to retrieve paper-based records than to retrieve electronic records. Paper-based records were mostly retrieved manually by physically visiting the archives (Patel & Chotai 2011). Read and Ginn (2015) underscore that electronic records require an appropriate system, such as an ERMS, for safekeeping and easy retrieval. Electronic records can be retrieved quicker, regardless of the place, if the user has access to the internet (Yuba 2013). Hence, six respondents indicated that records were stored both on the shelves and on ERMS. However, in most organisations the database would indicate that the record was either available or not available and point the user to where the record was shelved. The participants also indicated that records were stored in different applicable systems both in manual and electronic storage because the CSIR used a hybrid system. Participants further indicated that the physical storage at the CSIR refers to the shelves and boxes, while electronic systems refer to systems such as E-Procure and Microfocusvibes. The researcher observed that records were stored both in manual and electronic storage facilities and that paper-based records were stored on the shelves and electronic records were stored in the ERMS. The system analysis report also indicated that records were stored in manual storage such as the shelves and cabinets, and electronic records were stored in the ERMS.

5.2.4 Accessibility of records

Kutade and Dhamal (2014) opine that easy retrieval of records allows the users to access records quicker at any given time. When records were accessed quickly, the users were able to perform their task effectively and efficiently (Pyrene 2015). Therefore, it was the responsibility of organisations to ensure that they adopt and use the records management systems that ensure that their users have quick and easy access to records. Quick and easy access to records would ensure that the CSIR provides quality records management services to the users. Hence, the majority of five respondents indicated that the records at the CSIR were accessed either in person,

telephonically or via email. This was the case because the users could easily visit the registry when they needed a particular record, or quickly call the registry, or easily and quickly send an email to the records management practitioner to be provided with the requested record.

Furthermore, the respondents indicated that the most effective methods used to request records at the CSIR were telephonically and through email. It was easy to request records telephonically and via email because the records management practitioners could ask follow-up questions when clarity was needed. This helped to ensure that records were accessible quickly and easily at the CSIR. However, participants responded that users used the CSIR databases to access the records, because they can search the database quickly to access the records at the CSIR. The utilisation of databases assisted in making records accessible as quickly as possible. The researcher observed that the users physically walked into the registry to access the services. The researcher further observed that users called and sent emails to request records at the CSIR.

5.2.5 Records retrieval

Marutha (2021) underscores that manual records were retrieved from the shelves or cabinets via file or reference numbers. Read and Ginn (2015) also suggest that a file number or reference number was given to the file when created so that it would be easy to retrieve records. However, the retrieval of paper-based records can be time consuming (Ngoepe & Marutha 2021). Electronic records were retrieved through entering the reference number, subject, keyword or any other information of the record required, as programmed and created by the system (Pyrene 2015). Retrieving electronic records was the easiest method as records can be retrieved anywhere and at any time if there is network connectivity (Kutade & Dhamal 2014). Most respondents and participants opined that at the CSIR, records were retrieved electronically via in-house databases. Users use keywords, Boolean logic and filtered search strategy to retrieve electronic records in the ERMS at the CSIR.

However, the users should ensure that they use the correct information to search for records because failure to do so would mean the records requested would not be

retrieved. Paper-based records were retrieved physically by visiting the registry. However, sometimes it takes some time to access records on the shelves or the records were completely not available. Therefore, the users would be advised by the records management practitioners on the strategy that was most appropriate to retrieve records at the CSIR since hybrid system was used to manage records. The researcher observed and the system analysis report indicated that records were retrieved both manually by physically visiting the registry and electronically through ERMS.

5.2.6 Period taken to retrieve records

Literature by Mampe and Kalusopa (2012) suggest that retrieving paper-based records was more tedious than retrieving electronic records. Biron et al. (2014) further indicated that it takes time to retrieve paper-based record than electronic record that can be retrieved within seconds and minutes. Electronic records are just a button away, while paper-based records would be hiding between the shelves or in the boxes; therefore, it would always be easier and quicker to retrieve electronic records than paper-based records. Hence, the majority of three respondents stated that it took around 10-30 minutes to retrieve records at the CSIR.

However, they also indicated that it depends on the format of the record and where it was stored. Meanwhile, the minority of two respondents indicated that it took anything form 5 minutes to an hour to retrieve records at the CSIR. Another two respondents indicated that it took between 30 minutes to an hour to retrieve records at the CSIR. This means that it depends on which records format the users were looking for, as this would determine how long it takes to retrieve records at the CSIR. Some respondents also indicated that it could even take a week to retrieve records, especially paper-based records, at the CSIR. The participants also stated that electronic records could be retrieved immediately or within 5 minutes, but paper-based records could take time depending on where the records were stored. The researcher also observed that it took more time for the users to retrieve paper-based records than it took them to retrieve electronic records.

5.2.7 Condition of records management at the CSIR

Ngoepe and Marutha (2021) state that well-organised records support the operational and legal needs of the organisation. Maseh (2016) also opines that if an organisation uses unreliable systems to manage their records, they would not be able to manage their records effectively. However, the condition of the records, good or bad, determines the quality of services the organisation provides. Records that were in bad condition would lead to poorer records management services being provided by the organisation. While records that were in a good condition would boost the quality of services rendered by the organisation. The CSIR records were in a good condition; hence, six respondents indicated that records at the CSIR, both paper-based and electronic records were in a good condition. However, the minority of two respondents indicated that some of the paper-based records were not in a good condition. This might be because electronic records were maintained and protected against being damaged, while paper-based records could be easily damaged when used. The participants further indicated that both paper-based records (which were stored in the registry) and electronic records were in good condition. The researcher observed that records that were stored in the archives were in a good condition and so were electronic records.

Furthermore, this was supported by five respondents who agreed that records at the CSIR were in a good condition, while four respondents agreed that records were stored well. Records that were properly stored remained in good condition, hence most of the respondents indicated that the CSIR records were in a good condition. Records were in a good condition as a result of the proper maintenance of records. Hence, three respondents agreed that records were maintained at the CSIR. This might be because it was easy to maintain the electronic records to ensure they were always reliable and easy to retrieve . When records were well maintained, they would be protected against damage. Hence, four respondents agreed that records were safe and protected at the CSIR. Since archives were always locked away and required security codes and encrypted passwords for retrieval, it was clear that records might be safe and protected.

However, three respondents were not sure if records were easily retrieved. This might be because the CSIR made use of multiple systems; the users did not know where to start when searching for records. Meanwhile, another three respondents were not sure if records were easily disposed of. This might be because the CSIR used a hybrid system, which had a negative impact on the disposition of records at the CSIR. It might be because the respondents were not familiar with procedures to be utilised in a hybrid environment when records are disposed of.

5.2.8 Records classification system applied at the CSIR

According to the literature in Chapter Two, Duffus (2016) underscores that the classification of records helps to narrow down places in the organisation where records could be located. The classification of records helps that these records could be easily stored and retrieved. It was the responsibility of every organisation to ensure that their records are classified so that they could provide better records management services to their users (Mokhtar & Yusof 2017). Duffus (2016) further opines that records classification was important because records management practitioners were able to separate records of value from records of limited or little value. Those of value were made available and those of little value were archived. The CSIR also had its own classification system that was used to ensure that records were managed easily. Hence, the majority of five respondents indicated that they were aware of the classification system applied at the CSIR for the management of records. This was because the CSIR used the file plan guided by the national archives to classify the records.

However, only one of the respondents stated that they were not aware of any classification system at the CSIR. One of the respondents who were not aware of the records classification was a data librarian who participated in the study. Although she sometimes assisted in the registry, it was clear she did not know all the records management activities, hence she was not aware of the CSIR classification system. The participants also indicated that the CSIR used the file plan to classify records. Most organisations in South Africa made use of the file plan to ensure that their records were well classified. There are different classification systems that organisations can use to classify their records (Duffus 2016). Therefore, the CSIR had its own

classification system that was used to classify records. Hence, three (the most) respondents indicated that the CSIR utilised an alpha-numeric system and a numeric classification system. This might be because it was easy to locate records with the reference number that comprised the subject and file number. However, one respondent indicated that the CSIR used an alphabetical classification system. The researcher observed that records were classified according to alpha-numeric classification system.

5.2.9   Records maintenance at the CSIR

From the literature review, it was seen that Duranti and Rogers (2019) indicate that maintenance of records aims to ensure that records were in good condition and were easy to be retrieved when needed. However, Maseh (2016) explains that the records maintenance process includes the common maintenance of records and archives in the prevailing and semi-current records environment such as records offices and archives. Therefore, most organisations, such as the CSIR, also ensure that their records were well maintained to ensure that they provide effective records management services. Hence, four (the most) respondents indicated that the CSIR did maintain their records. This was because the CSIR used archival procedure and the file plan which assisted in the maintenance of records at the CSIR. However, the minority of two respondents indicated that they were not sure if the CSIR maintained their records. Some respondents might have indicated that they were not sure if records were not maintained because there might have been some records in their disposal that required to be maintained. Participants also responded that the CSIR maintained its records as per archival procedure to ensure they could be accessed easily. Participants further responded that electronic records were maintained through ICT policies because electronic records were stored and managed via the ERMS.

Some respondents also articulated that the CSIR scanned old records to the electronic system to maintain them electronically. However, there was a period in which organisations do maintenance of their records and it is entirely up to such organisations to determine when their records are maintained. Therefore, the CSIR also had their own timeframes for records maintenance. Hence, three respondents also articulated that records were maintained annually at the CSIR. This might be

because the CSIR archival procedure and the file plan stipulated that records were maintained annually. Another respondent stated that records maintenance occurred as per request; however, some records might need immediate intervention. The file plan should be flexible enough to allow records maintenance as per request. The document analysis report on the CSIR records management policy indicated that the CSIR kept upgrading their organisational systems and the migration of electronic records should be managed to ensure records remain properly managed, authentic and available when needed. The records management policy indicated that it was the responsibility of the ICT section to ensure that ERMS was upgraded.

5.2.10 Security measures for records at the CSIR

Based on the literature review, Franks (2018) states that security measures for paper-based records include that records should be stored in the records storage centre and access granted only to the employees working in that section. In some other instances, bibliometric systems were used to ensure that records management practitioners use fingerprints to gain access to the registry (Read & Ginn 2015). On the other hand, Darcy (2017) indicates that electronic records were accessed through encrypted security codes and passwords to ensure that records were not exposed to unauthorised people. Therefore, an encrypted password would be required for somebody to access the records. This would ensure that records were secured and protected against wrongful recipients. The CSIR also has its own security measures place to ensure that their records are always protected. The CSIR kept its registry and records storage centre locked, and access was only given to the staff, particularly the records management practitioners. The CSIR also protected its electronic records with encrypted security codes and passwords so that access could be limited to authorised people, as alluded in the literature. Hence, the majority of five respondents indicated that there were effective security measures in place to protect records at the CSIR. This might be because, at the CSIR, paper-based records were stored in a well-secured records storage centre, and electronic records required encrypted security codes and passwords to be retrieved. This was also supported by the participants who articulated that users had to use different methods as indicated above to ensure that records were secured and protected.

However, the minority (one respondent) opined that they were unsure if there were effective security measures at the CSIR. The users completed the register before accessing the records to ensure that the records were always protected. Participants suggested that records were controlled by the information security policy and were stored in the server to protect them against unauthorised access. However, in the absence of technological methods such as bibliometric systems to secure records, the organisation had to improvise to ensure that records were still secured. Hence, six respondents indicated that users completed the register before accessing records at the CSIR.

This might be a standard procedure set by the CSIR to ensure that people who access the records were identified before receiving the service. The majority of three respondents indicated the records storage centre was only accessible to records management practitioners. However, the minority (one respondent) indicated that the CSIR used a bibliometric system to access records. Participants stated that archives were always locked and only records management practitioners had access to physical records. Electronic records were encrypted with security codes and passwords to block unauthorised access to records. The records management system analysis reports also indicated that the system was secured, as it was available in the firewall of the CSIR and accessible using the CSIR credentials.

5.2.11 Backup system for records at the CSIR

A backup system assists the organisations in retrieving records when the original system was not functioning properly or when other records were damaged and could not be used again (Darcy 2017). In most organisations, manual records were used as a backup for electronic records. Paper records were shelved in the records storage centre so that when the ERMS was malfunctioning, the organisation would be able to function using the manual records management system. Some organisations even use the digital archives as backup (Duranti & Rogers 2019). Therefore, the CSIR also has its own backup system to ensure that its records are available and retrievable even when the main system was not functioning. Hence, the majority of respondents (five) indicated that the CSIR had a backup system for its records. This was because at the CSIR, electronic records were backed up to the cloud and the ERMS server. Electronic

records were also backed up with copies that were stored in the records storage facilities. However, the minority of one respondent was unsure of whether the CSIR had a backup system since the respondent was not aware of all records management systems at the CSIR.

Participants also suggested that records at the CSIR were backed up electronically in the cloud storage because The CSIR used the cloud storage and the local server as storage and backup facilities because records that were stored in the cloud and the local server would remain stored, unless they were deleted or corrupted by viruses. The records management system analysis report indicated that the ICT department did backup the system as per the ICT and information security policy. The researcher also observed that copies were kept in the records storage centres for backup purposes. The electronic records were also stored in the cloud storage facility as backup.

5.2.12 Disaster management plan for records at the CSIR

Jarrahi (2019) suggests that in order to avoid disaster in archives and registry, the storage facility, including durable archives boxes, must be a temperature-controlled environment and have protection against natural disasters. Marutha (2021) further articulates that the room should have the latest fire detection system and flood protection. A waterproof and fireproof environment should also be used to store paper-based records. Organisations developed and implemented the disaster management plan in order to avoid crises. When a crisis strikes, the organisation would be able to implement the mitigating steps towards resolving the crisis. Therefore, the CSIR also had a disaster management plan that could be implemented in the time of crisis. Hence, the majority of five respondents suggested that there was a disaster management plan in place at the CSIR.

The disaster management plan at the CSIR included having water and fire sensors to ensure that automatic fire extinguishers would be activated in case a fire breaks out. The records storage facilities were located strategically where there was no exposure to light and the temperatures were kept at a level where records would not be damaged. However, the minority of one respondent indicated that they were not sure

if the CSIR had a disaster management plan in place, since the respondent has limited knowledge of records management. The respondents also indicated that the CSIR disaster management plan also covered the management of records.

Participants also indicated that the CSIR considered environmental safety of records to avoid records being damaged by natural disasters such as floods and light. The document analysis report further indicated the use of the ICT system and the information security policy to make provision for processes for disaster management and recovery plan. The records management policy also refers to the long-term preservation and disaster recovery procedure for records. However, this was a new procedure and not yet approved.

5.2.13 Disposal of records at the CSIR

Jackson (2019) and Arp (2019) state that disposal of records refers to the removal of the records from the open shelves. It is a process that is guided by the archival procedures and the file plan to ensure that all records that have to be disposed of were attended to. Electronic records would also be deleted from the system when their life span ended (Arp 2019). Organisations also venture into the process of records disposal guided by the retention period on the file plan. All paper-based records that reach the end of their life span would be disposed of (Jackson 2019). Putcell (2019) opines that an organisation saves and sustains storage space by using an office or server vicinity to preserve records not required by the institution. Those records with enduring value would then be taken to the records storage centre or transferred to the digital archives.

Therefore, the CSIR performs the disposal of records to ensure that it complies with the records management regulations of the country. Hence, most respondents stated that records at the CSIR were disposed of according to the archival procedures and the file plan. Respondents further indicated that the records were disposed of after the retention period has expired, as stipulated in the CSIR file plan. Paper-based records were either shredded or transferred to the records storage centres if they had enduring value. Electronic records were disposed of by deleting them from the system. The document analysis report indicated that the policy that was used for the disposal of

records refers to the file plan and disposal authority for the disposal of records. The report also indicated that records that were due for destruction would be deleted or disposed of as required. The disposal authority stipulated that in the CSIR, the file plan served as the guideline for decision-making.

5.3   POLICY AND LEGAL FRAMEWORK FOR THE MANAGEMENT OF RECORDS

This section covers the discussion of the findings about the legislative and policy framework used to manage records at the CSIR to address the objective about policy and legal framework. According to Katuu and Van der Walt (2016), legislation and policy framework form a significant part in managing records effectively. The legislative and policy framework entails the South African legislative framework and policy framework that were used to manage the records at the CSIR. This section explains how the legislation was applied when managing records. It also explains how legislation influences the development of policies. Organisations make use of the policies to develop their own records management policy that would be used to manage their records.

5.3.1   Application of records management legislative framework

Legislative framework plays a crucial role in any institutional activity, especially in the records management industry. Legislative framework plays a vital role in ensuring that records were managed effectively. The literature review indicated that legislation provides guidance and direction as to how records should be created, kept and maintained for future institutional and individual accountability (Marutha 2019). The literature also indicated that the legislative framework provides guidance in the manner in which records were captured, transmitted, used, stored, indexed, retrieved, controlled and retained, and the employees of any institution must comply with the relevant legislation to ensure that services were well provided (Katuu & Van der Walt 2016; Netshakhuma 2019). South Africa also has its own legislative frameworks in the field of records management and the CSIR utilised them to ensure that their records were managed effectively and efficiently.

The records management industry establishes and develops policies through the legislative framework that would best manage the records in South Africa (Netshakhuma 2019). Therefore, the CSIR made use of the national policy framework developed in the industry to establish and develop their own records management policy. Hence, six respondents and participants indicated that they were aware of the legislative framework used to manage records at the CSIR. They also articulated that such legislative frameworks were applicable to records management practices at the CSIR. The CSIR used the legislative framework because it was at the heart of achievement of business goals in all business sectors, including in the archives and records management industry (Marutha 2019).

The CSIR also used the legislative framework because it had a tremendous impact on how records must be attained in overall realisation that records were created in an organisational setting and based on a national legislative and regulatory framework. Participants also always suggested that the CSIR used legislative framework for information governance to ensure authenticity of records and to ensure that the CSIR met legal requirements for records retention and disposal. They also indicated that legislative framework ensures that the CSIR as a public organisation complied with the national legislative framework and drafted and compiled the policy and strategic documents.

5.3.2 Electronic records management activities addressed by legislative framework

The policy also entails details on how organisations should manage their electronic records (Marutha 2019). The policy indicates that electronic records refer to any document that was created electronically, such as an e-mail, minutes or reports. The policy indicates that such records could be stored in the ERMS for proper management. Such records could be accessed and retrieved easily when they were required by the users. The policy also indicated that paper-based records could be digitised and converted to digital records. Many organisations have converted or are in the process of converting their paper-based records into digital records, and legislative policy stipulates how such process could be undertaken (Netshakhuma 2019). The policy also gives guidance on how electronic records could be accessed

and retrieved, how records should be stored in the server or cloud storage and on how electronic records should be maintained.

At the CSIR, policies were used to provide guidelines on the retrieval of records and to ensure that records were secured and saved, as confirmed by six respondents. However, legislative framework was also used for the creation, storage and maintenance of records, as five respondents stated. Electronic records refer to records that were created via a computer through, for example, typing and sending emails (Flynn 2001). The policy indicated the manner in which electronic records should be created, stored, maintained and disposed of at the CSIR. This means that records management practitioners relied on and referred to the policy to ensure that records were properly managed.

Participants articulated that the CSIR as a governmental body must comply with the NARSSA Act to ensure it achieves the principle of good management of records. Therefore, the CSIR has a responsibility to perform its duties as specified in the Scientific Research Council Amendment Act, No. 71 of 1990. The CSIR should further ensure that there is accountability, integrity and principles that come with good records management in ensuring that records were managed effectively managed. The participants also stated that legislative framework is used to provide guidance to the CSIR in order to comply with all the requirements of ensuring good records management practice was in place. The researcher observed that the CSIR records management does not effectively address the management of electronic records. The document analysis report also indicated that the electronic management system did not properly address the ERMSs.

5.3.3 South African legislative framework used to manage records at the CSIR

Literature shows that legislative framework assists in guiding institutions in managing their records so that there would be accountability from the employees rendering the records management services (Ngoepe & Saurombe 2016). According to the literature reviewed in Chapter Two, even though the colonial state failed to establish effective archives and records management framework (Katuu & Van der Walt 2016), there was a rapid development of such legislative frameworks to be used by government and

private bodies (Marutha 2019). Hence, the CSIR used the NARSSA Act and POPIA, as revealed by five respondents. The NARSSA Act plays a vital role in the industry in ensuring that records are effectively managed. Institutions also had to ensure that personal information was protected as they distribute information among their users.

Meanwhile, most of the respondents (four) indicated that the CSIR used POPIA and the Protection of Information Act. However, the CSIR must ensure that the right to information was not abused by enforcing the Protection of Information Act. However, the minority of one respondent indicated that the CSIR used the Constitution, PAJA and the ECTA.

Most of the respondents articulated that the CSIR used the following legislative framework to manage their records: the NARSSA Act, PAIA, the Protection of Information Act, POPIA, the ECTA, the Scientific Research Council Amendment Act and the Copyrights Acts 98 of 1978. The minority of the participants also mentioned that they used the King IV report and the Spatial Data Infrastructure Act. The researcher observed that the CSIR used the South African legislative framework to manage their records. The document analysis report also revealed that the CSIR used the South African legislative framework to manage their records effectively.

5.3.4 Utilisation of legislative framework to manage records at the CSIR

The legislative framework is used to ensure that organisations in the records management industry develop policies and ensure that a records management framework is followed when records are managed, and services provided (Netshakhuma 2019). Organisations make use of the legislative framework to develop policy framework that could be used for the effective and efficient management of records (Marutha 2019). The CSIR also used the South African legislative framework, such as the NARSSA Act of 1996 to develop policy framework such as the CSIR's records management policy to ensure that their records were properly managed. For electronic records, organisations such as the CSIR also used the ECTA Act to ensure that the electronic records were properly managed. Hence, the CSIR used the legislative framework to develop their policy on records management and electronic systems, as stated by four respondents.

Legislative framework plays a significant role in ensuring that records management policies are formulated and specify how those policies should be implemented. However, legislative framework was used to implement training for staff in records management, as indicated by three respondents. The legislative framework would also indicate how policies should infuse training in how records are managed in the organisation. The researcher observed that the legislative framework was used to develop the CSIR's records management policy. The document analysis report also indicated that national legislative frameworks were used to develop the CSIR's records management policy.

5.3.5 Gaps identified on the legislative framework for records management

Gaps in the legislative framework would affect the implementation and enforcement of legislation in the management of records. Gaps in the legislative framework would also affect the quality of the records management services the organisation would provide (Marutha 2019; Netshakhuma 2019). However, the respondents indicated that policies did not include the compatibility of ERMS. Therefore, the CSIR might not be able to manage their electronic records effectively as the policy did not clearly cover the issues related to the utilisation of ERMS and new technology for the management of records.

Respondents further indicated there was no enforceable legislation and governance at the CSIR. This might be because there was a lack of training in how policies were enforced and implemented in organisations. However, some respondents indicated they were not sure about the gaps in the legislative framework at the CSIR. However, participants articulated that there were no gaps in the legislative framework since it was reviewed via consultations with the public or stakeholders.

5.3.6 Improvement on the legislative framework for records management

The improvement of the legislative framework would assist the organisations to ensure that they have well-structured policies that would ensure that the management of records was effective and efficient (Katuu & Van der Walt 2016). Legislation has to be improved often to ensure there are no gaps that would hinder the quality of records

management services provided by organisations (Ngoepe & Saurombe 2016). Hence, the respondents indicated that the legislative framework should include the adoption and utilisation of a suitable ERMS. The CSIR should offer workshops on the application of legislative framework in the management of records and should enforce compliance with legislative framework within its employees to ensure they implement the CSIR policy framework for proper records management. The legislative framework should include guidelines on the implementation of ERMS for the proper management of electronic records. However, some respondents were unsure about the improvements that could be made to the legislative framework in South Africa. The participants articulated that no improvement was needed on the legislative framework. They indicated that it was because legislative frameworks were reviewed often through extensive consultation with the public and records management practitioners in the industry. The researcher also observed that the CSIR's records management policy covered important aspects of records management services since it has been revised recently.

5.3.7 Availability of policy framework for records management

The availability of the policy framework would ensure that the records management practitioners are guided on how records should be managed (Mosweu 2019) and it guides them on how records were created, used, maintained, stored and disposed of (Marutha 2019). As reviewed in Chapter Two, a policy framework enables the records management divisions to protect and administer their available records in a safe and professional way (Mosweu 2019). According to Katuu and Van der Walt (2016), organisations use the available legislative frameworks to develop their own policy framework. Organisations such as the CSIR also use the national policy framework compiled by the NARSSA Act to develop their own policy framework to manage their records. The CSIR has a policy framework that was utilised to manage records. Hence, six respondents indicated that they used the NARSSA Act to manage electronic records in governmental bodies; for instance, policy, principle and regulations to develop the CSIR's records management policy for the management of their records. Another five respondents acknowledged the availability of the national policy for records management and one respondent indicated that they used the following

policies developed under the national policies in South Africa to manage records: minimum information security standards policy, records management policy manual.

The respondents further affirmed that they used the CSIR's records management policy to effectively manage their records. Participants articulated that the policy governed the CSIR's records activities so that records would be reliable, authentic and accessible. The policy framework was used to provide guidance to the organisation with regard to appropriate infrastructure, resources and processes that were required to be in place so that data could be captured and disposed of. They further affirmed that the policies were written to provide guidance to the CSIR since the staff were required to comply with the policy framework when managing records. The policy governed the efficient management of records at the CSIR, including all stages of records management such as the creation, use, access, maintenance and disposal of records. The policy also governed and protected the confidentiality of records at the CSIR.

The document analysis report further concedes that the policies that were used for records management were the CSIR conditions of service, records management policy, and information security policy and privacy policy. The policy framework was used to govern and guide the employee on good records management practices at the CSIR. Document analysis reported that the CSIR records management policy covered the roles and responsibilities of the chief executive officer, CSIR management, chief information officer and records manager. The policy also provided guidance on access, use and disposal of records at the CSIR. Document analysis report indicated that the staff used the CSIR conditions of services, information security policy, privacy policy and good research guide to develop the CSIR records management policy. The researcher also observed that the CSIR used their records management policy to manage their records.

5.3.8 Records management activities covered in the CSIR policy framework

Netshakhuma (2019) suggests that policy framework is used to manage and facilitate the records management processes or activities. The policy framework covers the records management processes such as records creation, use, maintenance,

digitisation and disposal (Netshakhuma 2019). Hence, six respondents indicated that the CSIR utilised the policy framework for creating, preserving and conserving, maintaining, using and disposing of records. Netshakhuma (2019) opines that the utilisation of the policy framework is to ensure that there are proper records management practices at the CSIR. Participants affirmed that the policy covered the creation, receiving, maintenance, use, conservation and disposal of records. The document analysis report echoes that the policy included the following records activities: records creation and receipts, records storage, records maintenance, records access and records disposition.

5.3.9 Gaps in the policy framework for records management

On the other hand, organisations fail to provide good records management services because their policies are not well written and do not cover all the aspects of records management programmes in the organisation. Policy framework should not have gaps that would affect the proper and effective management of records in both private and public organisations (Katuu & Van der Walt 2016). However, respondents articulated that there was no full compliance with the policy framework at the CSIR, and the policy did not fully cover the section on and use of effective ERMS. However, respondents affirmed that the policy so far covered all aspects of records management at the CSIR such as records creation, use, maintenance, storage and disposal. Participants echoed that all the gaps have been addressed since their current policy has just been revised and the policy addressed everything that needed to be addressed at the CSIR in terms of records management. The document analysis report on the CSIR's records management policy indicated that there should be full compliance with the policy because the CSIR's records management policy framework came into effect on 6 January 2020, meaning it was still new and relevant.

5.3.10 Improvements to the CSIR policy framework for records management

Improved records management policy would be error free and would include all aspects of records management that are infused frequently as records management trends surface. An improved policy would assist organisations to manage their records effectively (Mosweu 2019). Hence, respondents pronounced that the improved CSIR

records management policy addressed the issue of full compliance within the organisation; staff had to ensure that they applied the policy framework effectively and efficiently and allow the records management practitioners to identify and use it effectively and efficiently the ERMS. Participants articulated that the only improvement needed was the execution of the policy framework at the CSIR to ensure records were managed effectively. The policy must be fully implemented to ensure that the records are managed effectively. The policy was last improved on 6 January 2020 and it was reported that issues pertaining compliance were revised regarding the policy when records management services were rendered.

5.4 ARTIFICIAL INTELLIGENCE INFRASTRUCTURE

This section deals with the interpretation of the findings based on the identification and utilisation of AI infrastructure that can be used to manage records at the CSIR. The AI model articulates the benefits of AI and includes the capability to solve problems related to errors committed by HI. AI is capable to provide effective service delivery and resolve complicated situations (Bowser et al. 2017). AI infrastructure refers to deep leaning, black box, automated classification, machine learning, natural language processing, automated rules and neural networks (Kalaiselvan, Sharma & Gupta 2021).

5.4.1 Artificial intelligence infrastructure for records management

AI infrastructure plays a crucial role in ensuring that records are managed effectively (Ali et al. 2020). AI consists of automated classification, automated digitisation, cloud storage, and quick and easy access and retrieval of records (Ripcord Company 2019). In order for the CSIR to manage their records effectively, adequate AI infrastructure was required to ensure that there was proper management of records in the organisations. However, the majority of four respondents stated that they were not aware of the AI infrastructure used to manage records, even after they attended the workshop. This might be because the respondents were not aware of the application and utilisation of AIT for the management of records before the workshop because the workshops covered several topics under study. Only two respondents indicated that they were aware of the AI infrastructure that could be used to manage records.

Respondents attended a workshop on the application of AIT for the management records before completing the questionnaire, hence they were aware of AIT for records management.

Participants responded that they knew AI infrastructure such as automated classification, which assists with the automated classification of records that were captured through a robotic machine. Participants also affirmed that they were aware of automated rules and indicated that it could help to control and assist with accuracy and speed when requests for records were made.

The minority of one respondent further articulated that they were aware of deep learning and NLP as AI infrastructure that could be used for the management of records at the CSIR. This might be because some of the respondents have read about the use of AI for the management of records. Deep learning uses a pyramid of terms, such as a classified file plan, to categorise content (Woodword 2018). NLP can be used to recognise concepts and metadata that are essentially pertinent to the file, as if an individual had physically read and selected concepts, rather than used the concepts that seem most used (Marcu & Marcu 2021). Hence, such AI infrastructure was used for effective and efficient management of records.

5.4.2 Rating of artificial intelligence infrastructure effectiveness in the records management

AI infrastructure should be effective in the management of records. Effective AI infrastructure would also ensure that records are managed effectively (Lepak 2019). The effectiveness of AI infrastructure will assist the CSIR in ensuring that records were digitised, auto-classified, stored in the cloud storage, quickly and easily accessible, and retrieved when requested. Hence, the majority of four respondents agreed that AI infrastructure would be effective for the storage and maintenance of records. This might be because AIT relies on cloud storage where a large amount of records could be stored safely.

This might be because AIT has the capacity to auto-classify records according to their subject, so that records with a similar theme could be stored together. Meanwhile,

three respondents agreed that AI infrastructure could be effective in records classification and a minority of two respondents agreed that AI infrastructure could be effective in disposing records. Respondents further indicated that AIT does quality control during records creation and assists with reading data. Participants affirmed that AI infrastructure could provide accurate, reliable and faster records management services. They further articulated that AI infrastructure provides quality metadata and accurate results for effective records management.

5.4.3 Availability of electronic records management equipment

The availability of relevant electronic resources would indicate the state of readiness of the organisations regarding the application and utilisation of AIT for the management of records (Wang & Siau 2019; Eike-Henner 2020). An evaluation was also done of the current records management system by means of system analysis and requirement conceptualised by Konrad et al. (2004). However, since the CSIR has not yet adopted the application and utilisation of AIT for records management, there was certain equipment such as robotic machines, that the CSIR would not have. On the other hand, the CSIR had most of the ICT resources that were used for records management. Hence, the majority of six respondents indicated that the CSIR had network coverage, which it used for emails and telephonic communications. This enabled the respondents to receive, request and send records to the users electronically.

Moreover, a minority of five respondents indicated that the CSIR had databases, a website and computer equipment which included printers and fax machines. This is the database that was used to retrieve records and it makes it possible to store records on the local server. The CSIR used Microfocusvibes to store and retrieve records and used its website to ensure that information about the organisation was communicated to the users. All these resources would assist the CSIR to migrate to AIT for the management of records in the near future. None of the respondents indicated robotic machines were available at the CSIR to manage records.

5.5 USABILITY OF ARIFICIAL INTELLIGENCE TECHNOLOGY FOR RECORDS MANAGEMENT

This section is about the interpretation of the findings based on the examination of the usability of AIT for the management of records. The term usability is a concept in TAM that refers to an activity of the ease of utility involving the learnability when an appropriate item would be used to determine the usage by particular users and activities in a particular environment (Karlsson 2016). Usability refers to whether AIT would be effective when applied and utilised in the management of records at the CSIR.

5.5.1 Improvement of artificial intelligence technology for records management

AIT has the potential to improve records management service across the country because it can perform records management activities better and faster than HI. AIT can do much work that HI struggles to perform. What HI can do in days, AI can do in minutes (Ripcord Company 2019). Hence, six respondents agreed that through AIT, records at the CSIR could be managed effectively. This might be because AIT was capable of scanning records faster and quicker, retrieving records quicker and performing automated classification of records. AIT was programmed to determine and flag records that were due for disposal. AIT would be programmed to identify when the retention period of records expired and delete the record on the system.

Moreover, the majority of five respondents also agreed that AIT could provide adequate maintenance of records. This might be because AIT was programmed to update records that were captured and ensure that records are kept save. AIT could also provide reliable storage facility. This might be because AIT was embedded in the cloud storage facility that could store unlimited amount of records. However, four respondents agreed that AIT could facilitate adequate records classification. AIT has the capacity to auto-classify records and store records under similar subjects. However, the minority of one respondent disagreed that AIT could provide reliable storage facility and AIT could provide reliable maintenance. Participants responded that AIT had the capability to capture and retrieve data faster than HI and it had a

reliable storage facility. AIT had the capacity to maintain records by flagging records that were corrupt.

5.6   RECORDS MANAGEMENT ACTIVITIES

This section deals with the interpretation of the findings based on records management activities at the CSIR that can be managed through AIT. Biraud (2013); Chaterera (2013) and Marutha (2021) state that records management activities include the records creation, maintenance, storage, retrieval and disposal as included in the records' life cycle and records continuum. Records management activities that can be managed through AIT include the creation of records, storage, use, classification, disposal, records movement and tracking, and records retrieval (Biraud 2013; Ambira 2016).

5.6.1   The rate of the CSIR's current records management activities

Records management activities refer to the creation, use, classification, storage, maintenance and disposal of records (Ambira 2016; Darcy 2017). Organisations such as the CSIR require a reliable records management system to ensure that they perform effectively in their records management activities. Hence, five respondents agreed that the CSIR had an effective records classification system and effective records access control and measurement. This is because records were classified according to the CSIR file plan and the archival procedures. Records were accessed both manually and electronically. Moreover, four of respondents agreed that the CSIR had effective retrieval capacity and records safety and security measures. It was easy for the records management practitioners to retrieve records at the CSIR. The records were secured and stored in the records storage centre and the cloud storage facility. Moreover, three respondents agreed that the CSIR had a reliable records movement tracking system and effective disposal system. This might be because the users were required to complete the register with all the details of the records before utilising them.

The CSIR used the file plan and archival procedures to ensure that records were properly disposed of. However, two respondents agreed that the CSIR had enough storage capacity. Paper-based records were stored physically in the records storage

centre. Electronic records were stored in the electronic system and the cloud storage. However, the minority of one respondent disagreed that the CSIR had effective retrieval capacity and a reliable records movement tracking system. This might be because the CSIR used different systems and users could not identify which storage capacity worked better. Without reliable storage capacity, it would not be easy to track the movement of files at the CSIR.

The respondents further suggested that the storage space was too small and electronic records were effectively stored, but paper records were misplaced. Some records seem to be missing before they could be captured, and there was an effective electronic records management backup system. Most records were not captured in the system, but records were retrieved better on the ERMS. The CSIR used an in-house alpha-numeric classification system. The CSIR also used a file plan classification system that was approved by the national archives. Respondents also indicated that only authorised staff had access to the records storage centres, and that encrypted security codes and passwords were used to access the electronic records.

Microfocusvibes ensured that the movement of electronic records was tracked. Records storage facilities were protected by climate control and security measures and electronic records were safely secured by firewall applications and the disposal of records at the CSIR was guided by the CSIR file plan. Participants indicated that the records management systems at the CSIR provided effective storage, retrieval, use, maintenance and disposal of records at the CSIR. The records management system provided effective classification, digitisation and creation of records at the CSIR.

5.6.2 Records management activities that may be discharged through artificial intelligence technology

Records management activities refer to the creation, retrieval, use, maintenance, classification, digitisation and storage of records (Read & Ginn 2015; Duranti & Rogers 2019). AIT has the capacity and capability to manage different records management activities. Therefore, it might not be all the records management activities, but the CSIR has to decide which records management activities may be managed through AIT. The records management activities determine whether records management

services would be provided effectively and efficiently to the users. Hence, six respondents indicated that AIT could be used for records retrieval.

Moreover, most respondents (six) indicated that AIT could be used for the safety and movement tracking of records. While four respondents indicated that AIT could be used for records classification, records storage, records maintenance and records disposal, the minority of three respondents affirmed that AIT could be used for records creation. The respondents further specified that AIT could be used for the following: records creation, records retrieval, records maintenance, records classification, records storage and records tracking and safety. Participants also affirmed that records management activities such as records creation, records maintenance, records retrieval and disposal of records could be managed through AIT at the CSIR. AIT could be used to classify, digitise and track movement of records at the CSIR.

5.7   USER UNDERSTANDING AND PERCEPTION ON ARTIFICIAL INTELLIGENCE TECHNOLOGY FOR RECORDS MANAGEMENT

This section deals with the interpretation of the findings based on the user understanding and perception of the application and utilisation of AIT for the management of records at the CSIR. Perception is a TAM concept that refers to the way in which the users of a particular system view the utilisation of that system (Knox et al. 2021). Based on the literature, user perception refers to the attitude and behaviour of the users regarding the utilisation of AIT for the management of records (Prigg 2017).

5.7.1 The meaning of artificial intelligence

Iron Mountain (2019a) and Perc et al. (2019) define AI as programmed robotic machines and computer programmes that are capable of automatically carrying out a complex series of actions in the field of archives and records management. However, AI can be defined in different ways by different researchers. Six respondents suggested that that AI refers to robotic machines. This might be because during the workshop, the researcher gave the context of AI as robotic machines because this

study investigated the utilisation of embedded robotic machines as part of AI for the management of records at the CSIR.

Meanwhile, four respondents indicated that AI refers to cloud computing, blockchain technology and internet of things. On the other hand, three respondents articulated that AI refers to big data and web of things. The participants also affirmed that AI is a machine that can learn to interact with humans and act like human. The participants further echoed that AI can perform all human functions and even do more, which was supported by Ripcord Company (2019) who opines that what HI can do in days, a robotic machine can do in hours.

5.7.2 Familiarity with the application of artificial intelligence technology for records management

In order for the records management practitioners to be able to utilise AIT effectively for the management of records, they should ensure that they familiarise themselves with the application of AIT (EE Publishers 2017). Records management practitioners at the CSIR would also have to familiarise themselves with AIT in order to utilise it effectively when managing records. Hence, three respondents indicated they were familiar with the application of AIT for the management of records. This might be because of the presentation presented by the researcher during the workshop or because the respondents have read articles around the application of AIT for records management. However, three respondents articulated that they were not familiar with the application of AIT for records management. This might be because the respondents required a more in-depth understanding of the application of AIT for records management apart from the presentation the researcher presented during the workshop and articles published on AIT for the management of records.

Participants suggested that the application and utilisation of AIT would not only benefit the retrieval of records, but it would also support the indexers, it would assign relevant metadata during capturing of records, it would handle large volumes of records, it would be linked to different classification systems and controls for vocabularies and would be able to automate the signing of metadata to records. AIT enables the integration of systems, it could assist with the automation and classification of content,

it would assist in the improvement and automation of manual capturing of records, it would help in retrieving records and would read the content of documents. It would help in the scanning/digitising of records and could work 24/7.

AIT provides effective management of records. AIT has a huge storage capacity and retrieval of records takes place quicker and easier. Hence, three respondents also responded that AIT manages records effectively, stores records effectively and retrieves records. This might be because records were stored in the cloud because of its huge storage capacity and could be accessed and retrieved anywhere at any time via the records management databases embedded in the electronic system. AIT has the capability to retrieve records faster than HI. However, two respondents indicated that AIT provides security for the records, which might be because some of the records management practitioners had no idea on the security features embedded in AIT for management of records.

Records management practitioners should have a clear understanding of the role of AIT in the management of records so that they would be able to provide effective records management services. Hence, the majority of four respondents stated that for them to understand AIT for records management, they must attend workshops on and trainings in the application and utilisation of AIT in the management of records. This might help the respondents to understand the role AIT plays in the effective management of records. Meanwhile, three respondents had no understanding of the application of AIT for records management. This might be because the respondents had never before read about AIT or attended a workshop and training before on how AIT was applied in the management of records. However, the minority of two respondents indicated that for them to understand the application of AIT for records management, they should write papers on AIT for the management of records. As they research the subject AI for records management, they would get a clear understanding on the role of AIT in the management of records.

5.7.3 Readiness to implement artificial intelligence technology for the management of records

The state of readiness is significant when adopting and utilising AIT for the management of records. Organisations should ensure that they have all the necessary resources or equipment to ensure that they are ready to implement and use AIT for the management of records (Ripcord Company 2019; Jarrahi 2019). The CSIR needs to have the relevant equipment or resources, and well-prepared and trained staff so that they would be able to apply and use AIT for managing records. However, the CSIR did not have all the necessary AI infrastructure to manage their records. Hence, six respondents articulated that the CSIR was not ready to apply and use AIT for the management of records. This might be because the respondents had no knowledge and understanding of AIT for the management of records. It might also be because the CSIR had no equipment that might enable them to manage records through AIT.

However, the participants indicated that even though the CSIR did not have the resources, once the staff have the knowledge and the resources, they would be able to use AIT for the management of records. However, the respondents also indicated that for them to apply AIT, the CSIR must conduct scientific or empirical research on the possibility to apply and use AIT for the management of records.

5.7.4 Improvements of records management services using of artificial intelligence technology

Records management services are likely to be improved when AIT is infused into the management of records at the CSIR. Records would be auto classified, stored in the cloud storage facility, and records would be easily retrieved through robotic machines and records management databases (EE Publishers 2017; Ripcord Company 2019). Hence, six respondents indicated that AIT would facilitate the smooth digitisation of records. This might be because AIT was able to perform the auto-classification and digitisation of records. Meanwhile, the majority of five respondents stated that AIT would provide easy retrieval of records and effective storage of records. This is because AIT could search for records quicker and had maximum storage capacity on

the clouds and the server. However, the minority of three respondents indicated that AIT provides effective protection of records.

AIT provides effective protection because accessing records via robotic machines, for example, would also require one to be in possession of encrypted access codes so that the robotic machine would be able to provide the requestor with the requested records. Participants indicated that AIT could be able to improve the current processes around records management and could rectify human errors made by HI through the NLP feature that was embedded in the AIT. This was because AIT was able to capture records, remove the stables, and digitise and classify records faster and easier via the deep learning machine, and the machine-learning algorithms that are embedded in the robotic machine. AIT can be programmed to perform such records management services and could not make the mistakes that HI makes.

5.7.5 Utilisation of artificial intelligence technology for records management

The views of the users regarding the utilisation of AIT for the management of records play a crucial role in ensuring that the users understand which role AIT plays in the management of records (EE Publishers 2017; Lepak 2019). Hence, the majority of five respondents indicated that AIT would provide effective records management services at the CSIR. This is because AIT would provide maximum storage capacity, retrieve records quicker and perform automated classification of records at the CSIR. Meanwhile, three respondents articulated that records would still not be effectively managed through the use AIT at the CSIR.

However, AIT can ensure that the CSIR records were effectively and efficiently managed because robotic machines would ensure that records were auto digitised, stored in the cloud facility and be retrieved quicker and easier. However, the minority of one respondent stated that records management practitioners would lose their jobs if AI was applied to manage records at the CSIR. Although many people still belief that AIT was here to take over their jobs, the adoption of AIT does not mean HI would be replaced with AI, but AI would merely support the HI at the CSIR. Participants also affirmed that AIT could facilitate accuracy in the management of records, contribute to

time and cost savings, assist in the disposal of records, help to capture a vast amount of data and help retrieve records faster.

5.8   SUMMARY OF THE CHAPTER

This chapter interpreted and discussed the findings of the study as presented in Chapter Four to give the readers a true meaning of the data. As part of the objectives of the study, the data discussed entails the legislative and policy framework used to manage records, the state of records management, records management activities that can be discharged through AIT, user perception of the application of AIT and AI infrastructure used to manage records at the CSIR. A framework for the utilisation of AIT in the management of records at the CSIR is presented and proposed in the next chapter. The proposed framework is believed to be helpful in addressing the records management situation at the CSIR.

CHAPTER 6

SUMMARY, CONCLUSION AND RECOMMENDATION OF THE STUDY

6.1   INTRODUCTION

The previous chapter presented the interpretation of the outcomes of the research. This chapter presents the summary, conclusion and recommendations of the study, as well as the summary and results of the study. In providing the recommendations, the researcher is attempting to give guidance to the organisation impacted by the problem in the study on the enhancement in their deprived performance and maintenance of their better performance. A framework to make use of AIT for the management of records at the CSIR is also presented in this chapter.

6.2   SUMMARY FROM THE FINDINGS OF THE STUDY

This section gives the summary of the research outcomes as vital, but more fixated on the important points, rather than on offering every exact outcome (Babbie 2013). The summary of the findings of the study is deliberated in this section grounded on the objectives of the study.

6.2.1 State of records management at the CSIR

The first objective of the study was to establish the current state of records management at the CSIR. For the CSIR to manage records effectively and efficiently, records at the CSIR should be in a good condition. A summary of the findings is presented below:

- Records were created and managed in both electronic and manual format.
- The CSIR used a variety of electronic systems such as Microfocusvibes and E-Procure to manage records. These systems provided the functionalities for the storage and retrieval of records.
- Records management practitioners used keywords, Boolean Logic and a filtered search strategy to retrieve records on the ERMS.

- Paper-based records and electronic records were also stored on the shelves, and in the cabinets, boxes, server and in the cloud.

- Records were accessed in person through e-mails and telephonically and retrieved via records management databases at the CSIR. Paper-based records were retrieved physically by visiting the registry.

- It took about 10-30 minutes to retrieve records at the CSIR. Electronic records can be retrieved immediately or within 5 minutes, but paper-based records can take time, depending where the records are stored.

- Both paper-based records and electronic records were in good condition.

- The CSIR's records were properly stored, safe and protected.

- Records management practitioners were aware of the classification system at the CSIR. The CSIR used an alpha-numeric classification system to classify their records as well as a file plan to classify records.

- The CSIR did maintain its records. Records were maintained as per archival procedure to ensure they were maintained properly. Electronic records were maintained through ICT policies because electronic records were stored and managed via ERMS. Old paper-based records were scanned into the electronic system so that records could be maintained electronically. Records were maintained annually or as per request.

- There were effective security measures in place to secure records at the CSIR. The CSIR locked its records storage facility and access was only granted to the staff. The CSIR also encrypted its electronic records with security codes and passwords so that access to records would be limited to authorised people.

- Users completed the register before accessing records to ensure that records were safe.

- The CSIR had a backup system. Electronic records were backed up to the cloud, a server and the ERMS. Electronic records were also backed up with manual copies that were stored in the institutional archives.

- The CSIR had a disaster management plan in place. This disaster management plan included having water and fire detectors to ensure that automatic fire distinguishers would be activated in case fire emergency. The records storage facility was located strategically where there was no exposure to light and the temperature was kept at a level were records would not be affected. The CSIR

considered environmental safety of records seriously to avoid records being damaged by natural disasters such as floods and light.

- The records of the CSIR were disposed of in terms of the archival procedures and the file plan. Records were disposed of after their retention period has expired, as stipulated in the CSIR file plan. Paper-based records were either shredded or transferred to the national archives if they had enduring value. Electronic records were disposed of by deleting them from the system.

6.2.2 Legislative and policy framework for records management

The second objective was to establish the legislation and policy framework used to manage records through AIT at the CSIR. Legislative and policy framework is used to regulate the management of records to ensure that records are managed effectively and efficiently. The following is a summary of the findings:

- Records management practitioners were aware of the legislative and policy framework used to manage records at the CSIR.
- Legislative framework was applicable to records management practice at CSIR.
- The CSIR used the South Africa legislative framework to manage records.
- The CSIR used the NARSSA Act for records management.
- The CSIR also used POPIA, the Protection of Information Act and PAIA to manage its records.
- The legislative framework was used to develop the CSIR's policy framework, electronic systems and records management framework. The policy framework governed the CSIR in how to use a policy framework to govern its records activities for compliance purposes.
- The policy framework guided the organisation on how records were created, stored, used, maintained and disposed.
- The CSIR used managing electronic records in governmental bodies: policy, principle and regulations framework to develop their records management policy.
- The CSIR used the policy framework for receiving records, records preservation and conservation, records maintenance and use, and records disposal.

- Policy framework should be implemented and compliance with the CSIR records management policy was of paramount importance.
- The CSIR's legislative and policy framework should also include the application of AIT for the management of records.

6.2.3 Artificial intelligence infrastructure for records management

The third objective was to identify the AI infrastructure that can be used to manage records at the CSIR. A summary of the findings is presented below:

- Most of the records management practitioners at the CSIR were not aware of the AI infrastructure that can be used to manage records; only a few records management practitioners were at least aware of it after the workshop presented by the researcher.
- The few records management practitioners who were aware of AI infrastructure identified deep learning and natural language processing.
- Records managers identified automated classification infrastructure that was embedded in the robotic machines.

6.2.4 Usability of artificial intelligence technology for records management

The fourth objective was about the usability of AIT for the management of records at the CSIR. The objective aimed to examine whether AIT would properly manage records at the CSIR. A summary of the findings is presented below:

- The current records management system had an effective records classification system.
- The current records management system had a reliable records movement tracking system.
- The current records management system had an effective disposal system.
- However, AIT would manage records more effectively and efficiently than the current records management system at the CSIR. AIT would use automated classification, machine learning, natural language processing, automated rules, black box, neural networks and deep learning algorithms to ensure that records are managed effectively.

6.2.5 Records management activities that can be discharged through artificial intelligence technology

The fifth objective was to examine the records management activities that can be carried out through AIT at the CSIR. Records management activities refer to records creation, records retrieval, records classification, records maintenance, records storage and records disposal. A summary of the findings is presented below:

- AIT could be used for records retrieval. Through AIT such as robotic machines, records could be retrieved from the cloud storage and the server through computer technology to be accessed on gadgets such as a laptop/desktop, phone or tablet.

- AIT could be used for the classification of records through the automated classification feature embedded in robotic machines.

- AIT could be used for records maintenance. Through machine-learning algorithm, robotic machines were able to detect records that need maintenance and alert the records management practitioners to facilitate the records maintenance process.

- AIT could be used to create records. Born digital records were created and transferred to digital archives through robotic machines.

- AIT can be used for records storage. Cloud storage facilities and servers are used as big data technology to store records.

- AIT could be used for records disposal. Through machine-learning algorithm embedded in the robotic machines, records that were due for disposal could be flagged. Records with enduring value would then be transferred to the digital archives for permanent storage.

6.2.6 User understanding and perception of artificial intelligence technology for records management

The sixth objective was to examine the user understanding and perceptions of the use of AIT for the management of records at the CSIR. A summary of the findings is presented below:

- Records management practitioners referred to AIT as robotic machines, cloud computing, big data, internet of thing and the web of things.

- At least after the workshop presented by the researcher, records management practitioners were familiar with the application of AIT for records management. Records management practitioners had a clear understanding of the application of AIT for records management. However, some records management practitioners had no clear understanding and they stated that attending workshops and training in the application of AIT for records management would give them a better understanding. Some records management practitioners even suggested that writing papers would also give them a better understanding of how AIT manages records.

- AIT manages records efficiently, stores records effectively and provides quicker retrieval of records. AIT also provides adequate security of records.

- AIT provides easy digitisation of records through embedded automated classification algorithm.

- Some of the records management practitioners claim that records would still not be effectively managed through AIT, while others claim AIT would take their jobs.

- However, the CSIR was not yet ready to use AIT for the management of records due to a lack of resources and knowledge of how to apply AIT for records management.

6.3   CONCLUSION OF THE STUDY FROM THE FINDINGS

Conclusions are presented based on the research objectives. According to Babbie (2013), the study should conclude with the statement of what the researcher discovered about his/her subject matter and where future research may be directed. Starting at the focus on the problem of the research, ineffective and inefficient records management resulted in records at the CSIR being lost, records being duplicated, system overloading and crashing, and records being sent an unintended recipient. Sometimes records would appear on the system but cannot be found on the shelves (or vice versa). As such, the records were not effectively and efficiently managed at the CSIR. Failure for the CSIR to manage their records effectively would affect its

services as the research institute in the country. It would be difficult for the researchers to locate records, and their research activities would be delayed and not concluded on time. As a result, the CSIR would not be able to contribute in the research and innovation space in the country, on the continent and globally. This would also affect the economy of the country because failure of the CSIR to participate in the global fraternity in terms of research and innovation, would lead to the world not being able to invest in the economy of the country.

That is why the key rationale of this study was to investigate and recommend an embedded AIT framework that would be applied and used at the CSIR for the effective management of digital records. This is for the purpose of achieving and providing effective and efficient records management services at the CSIR. The framework is presented and discussed as the last item under the next section, which deals with the recommendations of the study.

6.3.1 State of records management at the CSIR

This section gives the conclusion about the state of records at the CSIR. The CSIR used a hybrid records management system, meaning records were created and managed in both manual and electronic format. Paper-based records at the CSIR were also stored on the shelves, in cabinets, in boxes and on the CSIR ERMS – Microfocusvibes and E-Procure. The CSIR performed maintenance on its records annually or upon a request. The electronic records were maintained by the IT section in compliance with ICT policies. Records were also accessed by staff and researchers either in person, telephonically or via emails. Records were accessed via records management databases or manually by visiting the archives in person. Paper-based records were retrieved from the shelves or cabinets with a file or reference number. Electronic records were retrieved through typing the subject, keywords or other information of the record as required and programmed and created by the system. It takes about 10 to 30 minutes on average to retrieve records at the CSIR. However, electronic records were retrieved quicker, sometimes within five minutes, but it takes longer to retrieve paper-based records, sometimes it takes the whole day or week to retrieve paper-based records at the CSIR.

Records were classified through using the file plan and archival procedure as well as by means of the in-house classification system such as an alpha-numeric classification system. Records were also secured and protected through encrypted passwords and security codes. The records storage facility was always locked, and access was only permitted to the records management practitioners. Records were also backed up by storing them on the ERMS server and in the cloud. Electronic records were also backed up by copies that were stored in the archives. The CSIR had disaster management plan since they had fire and water detectors. Records were also not exposed to light and careful environmental safety measures were conducted to avoid records being damaged by natural disasters such as floods and light. Records were disposed of according to the file plan and the archival procedures. Paper-based records that had reached the end of their life span were removed from the shelves and destroyed. However, paper-based records with enduring value were transferred to the archive's storage facility for permanent storage. Electronic records that have reached the end of their life span were deleted on the CSIR ERMS server or cloud storage facility.

6.3.2 Legislative and policy framework

This section gives the conclusion on the establishment of the legislation and policy framework that were used to manage records through AIT at the CSIR. Legislation and policy framework play an integral role in the management of records at the CSIR. The CSIR used legislation such as the NARSSA Act, POPIA, PAIA, the Protection of Information Act and the ECTA to ensure that records were managed effectively. The CSIR also used this legislative framework to draft and establish the records management framework. However, the CSIR also used records management to develop their own, customised records management policy, which included: managing electronic records in governmental bodies: policy, principle and regulations, minimum information security standard policy, the records management policy and the CSIR privacy policy.

6.3.3 Artificial intelligence infrastructure for records management

This section gives the conclusion regarding identifying the AI infrastructure that could be used to manage records at the CSIR. Some records management practitioners were not aware of the AI infrastructure that was used to manage records. However, some were aware of the AI infrastructure that was used to manage records, especially after attending the workshop presented by the researcher. The following AI infrastructure was identified as being effective for the management of records by some records management practitioners and management at the CSIR: automated rules, deep learning and NLP algorithm. AI infrastructures were effective with the storage, classification and maintenance of digital records, and with the disposal of digital records. AI infrastructure provides accurate, reliable and faster records management services, quality metadata and accurate results for effective records management.

6.3.4 Records management activities for artificial intelligence technology

This section gives the conclusion about records activities that could be managed through AIT at the CSIR. However, a conclusion was made first on the rate of current records management activities at the CSIR. Current records management was rated to be effective, which means the CSIR had reliable records movement tracking. The CSIT also had an effective retrieval capacity system and disposal system and classification system. However, the management team also concluded that although some activities were managed effectively, most were not. The CSIR's records management system was not reliable to provide effective records management services. Even though the records management practitioners indicated that the disposal of records was effective, the management team holds the view that the disposal system was not reliable. However, it was also concluded that the records management activities that could be discharged through AIT were as follows:

- Records creation
- Digitisation of records
- Classification of records
- Records storage
- Records maintenance

- Records storage

6.3.5 User understanding, perception and usability of artificial intelligence technology for records management

This section gives the conclusion about the user understanding and perception of the application of AIT for the management of digital records at the CSIR. This section also gives the conclusions on the usability of AIT for the management of digital records. Records management practitioners had a clear comprehension of how to use AIT such as automated classification, NLP, deep learning, machine-learning algorithms and robotic machines that were used to manage the digital records properly and effectively. They ensure that they had a clear perception of what they think AIT could achieve when managing their digital records. They also had a clear perception of how AIT could be used to manage the digital records efficiently at the CSIR. This assisted the CSIR to decide on the better methods with which to infuse AIT for the management of digital records. They also decided on the kinds of training records management practitioners require to be able to work with AIT for the management of digital records. AIT was beneficial to the CSIR regarding the creation of electronic records, provision of cloud storage facility and effective retrieval of the digital records through embedded computer technology such as laptops/desktop, tablets and cellular phones. The perception of the records management practitioners was that AIT was capable to fasten the retrieval of records and scan/digitise them quicker.

6.4 RECOMMENDATIONS

Looking at the research problem, the AI framework for records management needs to be reviewed and improved by ensuring that it is embedded into effective records management systems at the CSIR. Implementation of the AIT framework will ensure that the CSIR provides quality records management services that address the current challenges encountered. The AIT framework will ensure that records are not duplicated when captured; once a robotic machine captured a document, it will not be captured again without alerting the records management practitioner that the document had been captured before. The AIT framework will also ensure that records are not lost once they are processed via robotic machines and stored in the server and on the

cloud storage facility, that records will be stored forever unless the records management practitioners remove or delete it. The AIT framework will also ensure that records are not sent to unintended recipients. Robotic machines will be properly programmed to ensure that it delivers the digital records to the rightful requestor. The AIT framework will also ensure that records that are stored in the server and cloud storage facilities are reflected on the database (and vice versa). Robotic machines have the capability to perform records management activities better and faster than HI. What HI can perform in days, AI can perform in minutes or hours. This study investigated, developed and recommended an embedded AIT framework that can be applied at the CSIR to ensure that records are managed effectively and efficiently. This framework will bring about sound records management practices that will assist the CSIR in producing quality research and innovations that will advance the country and ensure that the CSIR remains competitive in the area of research and innovations globally. The proposed framework is presented in this chapter in Figure 6.1.

6.4.1 Recommendation about the state of records management at CSIR

This section gives recommendations on the state of records management at the CSIR. It is proposed that records should be created and maintained in digital format only at the CSIR. Such records should be stored in the cloud storage facility and the ERMS (server) so that an unlimited number of records can be stored. The CSIR should use a single reliable ERMS to manage their records effectively and this system should be linked to the robotic machine and the cloud storage facility. This would then ensure that digital records were accessed through a database that allows the users to browse through records remotely. Digital records should be retrieved through technological devices such as a laptop/desktop, tablets and cellular phones. The users would then be able to go through the list records on their devices and they would be able to save them, print them and even send them via email. However, the CSIR should ensure that only permitted people have access to their cloud storage facilities and servers as digital records should only be accessed by records management practitioners to ensure that records are always kept safe.

Digital records should be retrieved through typing the reference number, subject and keywords on the database and through using Boolean Logic and a filtered search

strategy to retrieve records in the ERMS. However, it should not take longer to retrieve digital records. The estimated time it should take to retrieve the digital records should be between 5 and 10 minutes, or even less. Digital records should be classified and maintained using AIT. The CSIR should have a backup system through a cloud storage facility and digital archives. The CSIR should also use AIT to detect viruses and firewalls that could corrupt their digital records. Robotic machines should have antivirus software embedded to ensure that records are protected against such viruses.

6.4.2 Recommendation about legislative and policy framework

This section gives recommendations about the legislative and policy framework that was used to manage records via AIT at the CSIR. The CSIR should use the legislative framework to ensure that digital records were completely managed through AIT. However, it was recommended that the CSIR should ensure that legislative and policy framework is applied and was complied with when managing and providing digital records management services. The records manager should ensure that records management practitioners enforce compliance with the records management policy when managing digital records via AIT. The policy and legislative framework should provide guidelines on how AIT should be implemented in the management of digital records. Policy and legislative framework should also be clear on how AIT would be infused and applied for the management of digital records. The policy and legislative framework should also infuse a training intervention/programme on the application of AIT for the management of digital records at the CSIR.

6.4.3 Recommendation about artificial intelligence infrastructure for records management

This section gives recommendations on the identification of AI infrastructure that could be used to manage records at the CSIR. It is recommended that records management practitioners should familiarise themselves with AI infrastructure that were used to manage the digital records. Such AI infrastructure was as follows: deep learning, machine learning, robotic machines, NLP and automated classification algorithms. These AI infrastructures should be reliable in the retrieval, use, storage and disposal

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of the digital records; therefore, it was the responsibility of the CSIR to ensure that they have the appropriate AI infrastructure for the management of digital records. They also ensure that the records management practitioners receive training in the utilisation of AI infrastructure and in how to manage their digital records.

6.4.4 Recommendation about usability of artificial intelligence technology for records management

This section gives recommendations on the usability of AIT for the management of records at the CSIR. AIT that is user-friendly would ensure that there is improvement in the management of digital records. Records management practitioners would not struggle to digitise and transfer records through embedded automated classification algorithm. AIT would also ensure there was improved cloud storage facility for the digital records. AIT should be programmed in such a way that it would detect and flag records that need maintenance. AIT would then be able to also detect viruses that have the ability to corrupt the digital records. AIT should be able remove the threats posed by the viruses so that the digital records would remain protected. AIT should also improve the retrieval of digital records through databases embedded in robotic machines, accessibility and irretrievability devices such as a laptop/desktop, tablet and cellular phones.

6.4.5 Recommendation about records management activities through artificial intelligence technology

This section gives recommendations on the records management activities that can be managed through AIT at the CSIR. Digital records should be classified, retrieved and stored effectively at the CSIR. However, the following records management activities should be managed through AIT: records creation – this refers to born-digital records should be processed and created via AIT; records retrieval – AIT such as robotic machines with embedded databases and searching platforms should be used to retrieve records quicker and faster; records storage – the CSIR should use the cloud storage facility and the server that is embedded in the robotic machine to store unlimited amount of documents; records digitisation – paper-based records should be scanned through the robotic machine and stored in the cloud storage facility and server

at the CSIR, paper-based records would be shredded afterwards; automate classification – records should be auto-classified through robotic machines and stored according to subject matter to ensure similar records are classified and stored together; records disposal – robotic machine should be programmed in such a way that they would be able to automatically detect digital records that have reached the end of their life span and delete them immediately. Digital records with enduring value should be automatically transferred to digital archives for archiving purpose.

6.4.6 Recommendation about user understanding and perception on artificial intelligence technology for records management

This section gives recommendations on the user understanding and perception of the application of AIT for the management of records at the CSIR. AI should be explained as robotic machines embedded in cloud computing, big data, internet of things, web of things and blockchain technology that were capable to manage records effectively. Records management practitioners should ensure that they familiarise themselves with the application and utilisation of AIT for the management of records. They should know how robotic machines operate in order to provide effective records management services at the CSIR. Records management practitioners should attend workshops and training and write papers on the application of AIT for the management of records so that they would have a clear understanding about AIT in records management. The CSIR should ensure they conduct research on the application of AIT for effective records management so that they familiarise themselves with what and how AIT is applied and used to manage records. AIT would not replace records management practitioners but would support them to provide effective digital records management services at the CSIR.

5.4.7 Recommendation about the proposed framework to use artificial intelligence technology for the management of records at the CSIR

This section gives recommendations on the nature of AIT framework that will be applied and used to manage digital records effectively at the CSIR. This AIT framework should to address the records management challenges such as system crash and overload, duplicating records, records lost, records sent to unintended recipients and

records appearing on the system but not on the shelves (or vice versa). The AIT framework would also address the challenges faced by the users when retrieving records and the challenges related to the classification of records. The AIT framework would also address the challenges of records disposal that the CSIR was struggling with due to the challenges faced by the current records management systems. The AI framework would ensure that paper-based records are scanned and stored via the robotic machine to the server and cloud storage facilities embedded in the robotic machine. The robotic machine would also auto-classify records for easy and reliable automated classification of records and would be used to assist in terms of records maintenance. Digital records that need maintenance would be flagged by a robotic machine; such records would either be deleted or edited to correct the error.

A robotic machine would be programmed to facilitate the process of records maintenance and the AIT framework would address the retrieval of records at the CSIR. Robotic machines would ensure that records are retrieved quickly when they were requested. Robotic machine would also assist during the records disposal process. The robotic machine would ensure that records that have reached the end of their life span are flagged and deleted from the server and the cloud storage facilities. If those records were of enduring value, they would be transferred to the digital archives through robotic machines.

6.4.7.1 Recommended framework

The central objective of this study was to recommend a framework that could implement AIT and records management at the CSIR so that records would be effectively managed through robotic machines at the CSIR. The framework illustrated in Figure 6.1 was introduced with the intention to apply AIT for the management of records. This framework was designed to address the challenges that were faced by the CSIR in terms of their current records management systems. Once the CSIR applies and uses this framework effectively, they would have one reliable system to manage their records effectively, better than using the multiple systems that have been used at the CSIR up to now. All these challenges related to system crash and overload, records duplication, loss of records, misplaced records, records sent to unintended recipients and records appearing on the system, but not on the shelfs (or vice versa)

and would be addressed by the utilisation of AIT for effective records management. A robotic machine would be embedded with an effective cloud storage facility and server storage so that unlimited amounts of digital records could be safely stored. AIT would also ensure that records duplication was decreased. Once records were also stored in the cloud, they would never be altered and deleted unless they were disposed of or deleted intentionally by records management practitioners. A robotic machine auto-classifies and ensures that records were stored according to the subject or as guided by the file plan, hence digital records would never be lost or misplaced, and those digital records would be easily retrievable. A robotic machine would also be equipped with features such as deep learning and machine-learning algorithms to ensure that they send the records to the actual person who requested the record to avoid records sent to unintended recipients.

The study proposes a framework for the application and utilisation of AIT for the management of records at the CSIR, as illustrated in Figure 6.1, which flows from AI and robotics model, records life cycle model and continuum model. These models are known for their ability to deal with the application of AI and robotic machines and the life cycle of manual and electronic records, as discussed in Chapter Two. The models were used because the study is about the application of AIT for the management of records at the CSIR.
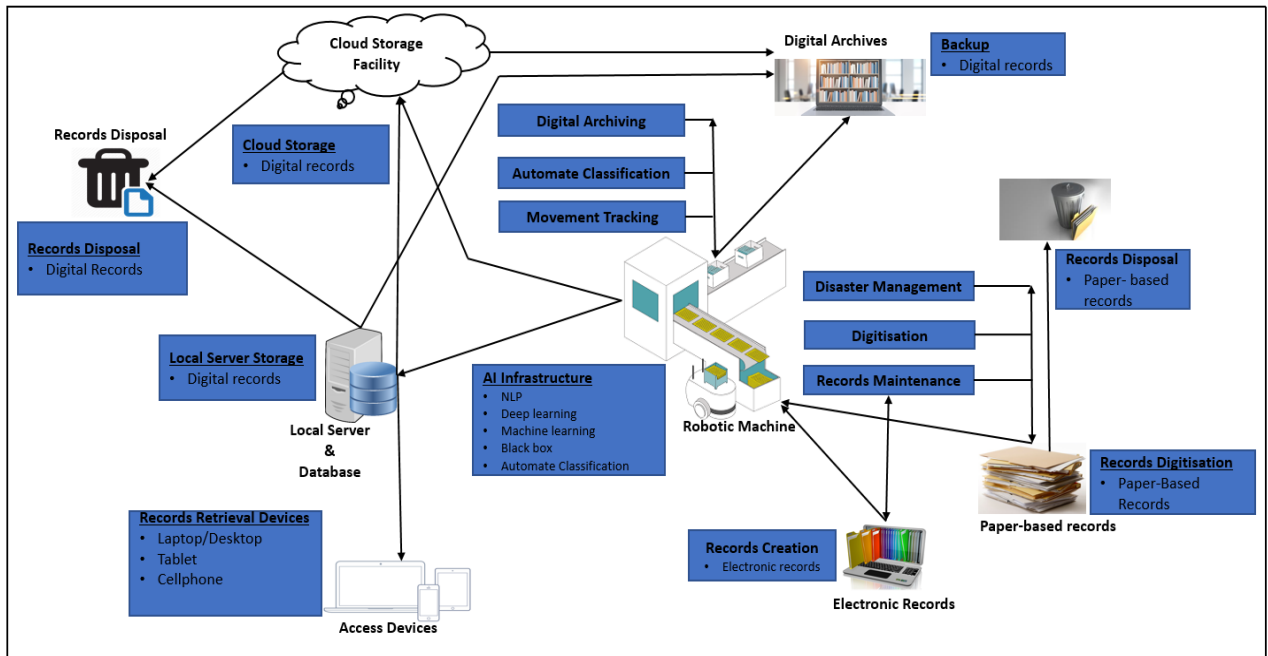
Figure 6.1: Framework for utilisation of artificial intelligence for records management (Researcher 2021)

This proposed model begins with the creation of records, which is created in electronic format. The creation of electronic records is followed by the digitisation of paper-based records. All the available paper-based records are digitised through automated classification algorithm embedded on the robotic machine and converted into digital records. The robotic machine uses the automate classification algorithm to ensure that records are classified by subject. The creation of paper-based records will then be discontinued, and records will be created only in the electronic format.

All paper-based records will be shredded after the digitisation processes. However, before the commencement of the digitisation processes, records will be maintained and checked for any damage. Paper-based records that are damaged will be fixed first and those that cannot be fixed will be disposed of immediately. Paper-based records that have reached their disposal date will be disposed of before the digitisation process. The CSIR will create and maintain only the electronic records. Electronic records refer to the born-digital records or records that are created electronically by the personnel on a daily basis. Such records will then be maintained to ensure they are error free before they are transferred through the embedded robotic machine to the storage facilities such as the server and cloud storage facilities.

Once all the CSIR's records are converted to digital records using robotic machines, they will be auto-classified according to subject matter via the automated rules algorithm embedded in the robotic machine. This will ensure that records with similar subjects are classified together via the black box algorithm of the robotic machine. The robotic machine will also track the movement of records through the machine-learning algorithm to ensure that all records captured move from one stage of digitisation and transfer until the records retrieval stage.

Once records are digitised/transferred and classified through automated classification algorithm, they will be stored in the cloud storage facility and the local server storage facility. The CSIR will ensure that through storing the digital records on the cloud storage and the local server, records are securely protected. Records will be protected through encrypted passwords and the security codes to ensure that only authorised people will have access to them. Through its deep learning algorithm and machine-learning algorithm, robotic machines would also be able to detect when the life span of digital records expires. Such digital records will be deleted from the cloud and the local servers automatically. The disposal process will take place continuously via the machine-learning algorithm and the neural network algorithm of the robotic machine once the disposal period is reached. Digital records will be deleted automatically from the cloud storage and the server.

The robotic machine does not need to be programmed repeatedly to perform records management activities that have already been performed. The robotic machine will use the neural network algorithm to process the new information on its own. Digital records with enduring value will be transferred automatically from the cloud and the server to the digital archives for archiving purposes. The digital archives will be used as a backup system for all the digital records produced and managed by the CSIR.

Digital records will only be accessed and retrieved technologically at the CSIR through the NLP algorithm embedded in the robotic machine. The users will be able to retrieve digital records that are stored in the cloud, the local server and the digital archives, depending on where the records are located at that point of time. The records management practitioners will use computer technology such as a laptop/desktop,

tablet or phone to retrieve the digital records. The records management practitioner can either search for the digital records using a subject, Boolean Logic search strategy or any other strategy that will help them retrieve the digital records through the database embedded in the cloud storage facility, server storage facility and digital archives. All records with similar subjects will be displayed on the screen of the gadget used to browse such as laptop/desktop, tablets and cellular phone. The records management practitioner will then browse through all digital records appearing on the screen of the gadget to select the one they are looking for. The records management practitioner will click on the record to open it, the digital record can then be printed, sent via email or saved on the gadget used to browse.

6.5 IMPLICATIONS OF THE RESEARCH FOR THEORY, POLICY AND PRACTICE

The outcomes of this study outlined and emphasised many of the essential subjects for consideration in enhancing of records management services and standard at the CSIR through the application and utilisation of AIT. Most of the issues presented by the study are critical to the extent that they affect the standard and effectiveness of records management services at the CSIR. However, the study went further and recommended a suitable solution for every challenge and problem explored. If appropriately implemented, the recommendations of this study might result in satisfactory management of records management practice at the CSIR. This is because the recommendations intend to address the challenge of system overload and crash, duplicated records, losing of records, misplacing of records, records sent to unintended recipients and records appearing on the shelves but not on the system (or vice versa). Through AIT, such challenges would be addressed because the robotic machine would be developed and programmed in such a way that it would provide effective cloud storage capacity and automated classification, and address requests appropriately. AIT also would assist the users with faster retrieval of records, scanning and classification of records according to the in-house classification system, providing a backup of records, preparing effectively for disaster management and it would safeguard the records effectively against hazards, perils and unlawful access. AIT would also assist with the disposal of records at the CSIR. This study also recommended embedded framework that would assist the CSIR in applying and using

AIT to manage their records effectively and efficiently. Generally, the framework is coined based on the CSIR's records management needs. Overall, this study contributes much to theoretical and conceptual knowledge in the field of digital archives and records management, particularly in the application and utilisation of AIT for the management of records. The study ensured that the CSIR has a source of reference for establishing their own policies, procedures and best practices based on the findings, recommendations and framework introduced or proposed. It also guides the systematic establishment of the records management programme, its operation and systems.

6.6   SUGGESTIONS FOR FURTHER RESEARCH

This study had different objectives to achieve and all objectives were achieved in a scientific manner. Findings on the following items aligned to the objectives were presented and recommendations were made to the organisation and other research institutes nationally, continentally and globally to be used as a guide to scientifically achieve the following:

- Legislation and policy framework have been established.
- The status of records has been determined.
- Records management activities that can be discharged through AIT have been examined.
- User perception of the utilisation of AIT for the management of records has been examined.
- AI infrastructure that can be used to manage records has been identified.
- A framework to manage records through AIT was recommended.

However, there are many areas where AIT can be applied to provide effective records management services, and studies must be done to ensure intensive findings and solutions so that, eventually, the CSIR would achieve the smooth running of knowledge production and innovation as it is their key responsibilities in the country.

This study recommended the application and utilisation of AIT for the management of records at the CSIR, but further studies would be recommended the application of AIT

for the management of records at other research institutions in South Africa such as Human Science Research Council (HSRC), National Research Foundation (NRF), Agricultural Research Council (ARC) and South African Medical Research Council (SAMRC). Research institutions play a crucial role in knowledge creation and innovation in the country; hence, they should have the resources that would assist them to be productive and provide effective and efficient services.

6.7   FINAL CONCLUSION

In conclusion, the CSIR has already established records management programmes. However, the records management programme has shortfalls that need to be addressed. The CSIR records management programmes shortfalls include system overload and crash, duplication of records, loss of records and records that have been displaced, records sent to unintended recipients and records captured in the system but not on the shelves (or vice versa). The study made several recommendations about the improvement of records management services at the CSIR. Instead, the central point is that the records management framework was not effective and had to be reviewed and improved as proposed by this study, and it had to ensure that AIT is embedded into the effective management of digital records at the CSIR. This could ensure that digital records are stored in the cloud and on servers embedded in robotic machines. Robotic machines would also assist in records maintenance and disposal and provide disaster management. AIT would also provide effective backup of records through a cloud storage facility and servers as entrenched in robotic machines. The CSIR as a research institute needs effective digital records management systems that would ensure that the researchers do not struggle to retrieve and access the digital records. Quicker and faster retrieval of records would assist the CSIR to complete their research projects on time. Once the CSIR is able to complete their projects on time, they would be able to contribute positively to the knowledge production and innovation. By so doing, they would be able to be competitive among the research institutes across the universe. It is, therefore, very important for the CSIR to apply and utilise AIT such as embedded robotic machines for the effective and efficient management of digital records. This will ensure that digital records are well managed at the CSIR.

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APPENDIX 1: LETTER USED TO REQUEST APPROVAL TO CONDUCT THE STUDY AT THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

MODIBA MT (41875877)

University of South Africa

Department of Information Science

P O Box 392

UNISA

0003

23 April 2019

The Manager

Council for Scientific and Industrial Research

P O Box 395

0001

Dear Sir/Madam

This letter serves to request your approval for me to conduct a research study about the application of AIT for the management of records at your institution. The researcher is a lecturer at the University of South Africa but intend to assist the CSIR to implement the recommendation of this study upon completion.

I am currently a PhD (Doctoral) student in the Department of Information Science at the University of South Africa (UNISA). The study is about "***Utilisation of artificial intelligence technology for the management of records at the CSIR in South Africa".*** The purpose of the study is to investigate, develop and recommend an effective framework to apply AIT for the management of records at the CSIR. This will assist the records management practitioners at the CSIR to effectively and efficiently manage CSIR records to support the production of knowledge and research as central functions of the CSIR.

The CSIR will benefits a lot from the information obtained and the resultant recommendations for its management decision-making and problem solving. The results of this study will also assist a lot for administrative officials who are directly or indirectly affected by the records management practice at the CSIR.

In completion of the study the researcher will donate a copy of the dissertation to the CSIR for its library and information centre to enable convenience reference. Confidentiality will be ensured on the data collected for the study. Attached is the letter issued by the University of South Africa (Unisa) as a means of verification for my study, ethical clearance, research proposal and consent form.

Thanking you in anticipation for your forthcoming positive response.

Yours faithfully

Mashilo Thomas Modiba (Mr.)
PhD Student: University of South Africa (UNISA)
Cell Number: 072 633 8044
E-mail: modibmt@unisa.ac.za

APPENDIX 2: LETTER OF APPROVAL TO CONDUCT THE STUDY AT CSIR

CSIR

our future through science

CSIR Planning & Knowledge Management

PO Box 395 Pretoria 0001 South Africa
Tel: +27 12 841 2167
Fax: +27 12 349 1153
Email: 2019:0001PL

15 May 2019

Thomas Modiba (41875877)
University of South Africa
Department of Information Science
P O Box 392
UNISA
0003

Re: Request to conduct a study at the Council for Scientific and Industrial Research (CSIR)

Thank you for your request to conduct a study titled "Adoption of artificial intelligence technologies for the management of records in CSIR in South Africa" at the CSIR. As Group Manager: Planning & Knowledge Management I duly note the Ethics Approval Certificate (dated 16 April 2019, Ref: 2019-DIS-0012) from the University of South Africa (Unisa). I herewith grant permission for the study to proceed as per the Unisa approval with the provision that you provide the CSIR with progress reports throughout the study as well as a final report on completion of the research.

We wish you all of the best with your research project.

Kind regards

Business Excellence & Integration
Group Manager: Planning & Knowledge Management
Dr Daniel Visser

Open Rubric

16 April 2019

Dear Mr Mashilo Thomas Modiba

DIS Registration #: Rec-160419
References #: 2019-DIS-0012
Name: MT Modiba
Student #: 41875877

Decision:

Ethics Approval from 16 April 2019 to 16 April 2024

_____

Researcher(s): Mr MT Modiba

       41875877@mylife.unisa.ac.za

       012 429 6294

Supervisor(s): Prof P Ngulube

       012 429 2832

Utilisation of artificial intelligence technology for the management of records in CSIR in South Africa.

Qualifications: Doctoral Study

Thank you for the application for research ethics clearance by the Unisa Department of Information Science Research Ethics Committee for the above-mentioned research. Ethics approval is granted for five years.

The ***low risk application*** was reviewed and expedited by the Department of Information Science Research Ethics Committee on 16 April 2019 in compliance with the Unisa Policy on Research Ethics and the Standards Operating Procedure on Research Ethics Risk Assessment. The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy of Research Ethics.

2. Any adverse circumstances arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Department of Information Science Ethics Review Committee.

3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.

4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards the protection of participants' privacy and the confidentiality of the data should be reported to the Committee in writing, accompanied by a progress report.

5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no. 4 of 2013; Children's Act no. 38 of 2005 and the National Health Act, no. 61 of 2003.

6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.

7. No field work activities may continue after the expiry date of **16 April 2024**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

*The reference number **2019-DIS-0012** should be clearly indicated on all forms of communication with the intended research participants, as well as the Committee.*

Yours sincerely

Dr Isabel Schellnack-Kelly

Department of Information Science: Ethics Committee

APPENDIX 4: SURVEY QUESTIONNAIRE/INTERVIEWS INFORMED CONSENT FORM

QUESTIONNAIRE INFORMED CONSENT FORM
"UTILISING ARTIFICIAL INTELLIGENCE TECHNOLOGIES FOR THE MANAGEMENT OF RECORDS AT THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH IN SOUTH AFRICA"

I am Mashilo Modiba and a PhD (Doctoral) student for Information Science at the University of South Africa (UNISA). I am conducting a research study on *"Utilisation of artificial intelligence technology for the management of records at CSIR in South Africa"*. The purpose of the study is to investigate the utilisation of AIT for the management records at CSIR in South Africa. The information obtained, and the result recommendations could assist CSIR in the effective and efficient management of records. Participation in this study is absolutely voluntary.

The information in this questionnaire will not be used for any other purpose than for this study. You are not required to provide your name and will therefore remain anonymous. The aim of the questionnaire is to evaluate your opinion, perceptions and feeling about the utilisation of AIT in the management of records at CSIR. The results of the study will be used to help answer unanswered questions as far as the application of AIT for the management of records is concerned. Other possible benefits for participating in this study are as follows: opportunity to share your experiences, contribute to knowledge and records management improvements programmes. It is on these bases that the researcher is requesting you as the study participant to give consent through this form for your participation in the study. Should you have any question or seek any clarity, feel free to ask the researcher at any time of your participation at modibmt@unisa.ac.za or 072 633 8044 or the supervisors, Prof P Ngulube at 012 429 2832 or ngulup@unisa.ac.za and Dr N Marutha at 012 429 6709 or emarutns@unisa.ac.za.

I hereby give consent for me to participate in this study and that the information I provide in the questionnaire will be used for accomplishment of this research project. The information provided will be treated with high degree of confidentiality as stated in

this consent form and will therefore remain anonymous. Please put a cross (X) next to the following question.

- I need to receive copy of research report summary in completion of the study

Yes

No

_____   _____

Participant signature   Date

INTERVIEW INFORMED CONSENT FORM
"UTILISING ARTIFICIAL INTELLIGENCE TECHNOLOGIES FOR THE MANAGEMENT OF RECORDS AT THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH IN SOUTH AFRICA"

I am Mashilo Modiba and a PhD (Doctoral) student for Information Science at the University of South Africa (UNISA). I am conducting a research study on *"Utilising artificial intelligence technologies (AIT) for the management of records at CSIR in South Africa*". The purpose of the study is to investigate the utilisation of AIT for the management records at CSIR in South Africa. The information obtained, and the result recommendations could assist CSIR in the effective and efficient management of records. Participation in this study is absolutely voluntary.

The information in this interview will not be used for any purpose other than for this study. You are not required to provide your name and will therefore remain anonymous. The aim of the interview is to evaluate your opinion, perceptions and feeling about the utilisation of AIT in the management of records at the CSIR. The results of the study will be used to help answer unanswered questions as far as the application AIT for the management of records is concerned. Other possible benefits for participating in this study are as follows: opportunity to share your experiences, contribute to knowledge and records management improvements programmes. It is on these bases that the researcher is requesting you as the study participant to give consent through this form for your participation in the study. Should you have any

question or seek any clarity, feel free to ask the researcher at any time of your participation at modibmt@unisa.ac.za or 072 633 8044 or the supervisors, Prof P Ngulube at 012 429 2832 or ngulup@unisa.ac.za and Dr N Marutha at 012 429 6709 or emarutns@unisa.ac.za.

I hereby give consent for me to participate in this study and that the information I provide in the interview will be used for accomplishment of this research project. The information provided will be treated with high degree of confidentiality as stated in this consent form and will therefore remain anonymous. Please put a cross (X) next to the following question.

- I need to receive copy of research report summary in completion of the study

Yes

No

| Participant signature | Date |

APPENDIX 5: SURVEY QUESTIONNAIRE

SURVEY QUESTIONNAIRE
"UTILISING ARTIFICIAL INTELLIGENCE TECHNOLOGY FOR THE MANAGEMENT OF RECORDS AT THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH IN SOUTH AFRICA"

I am Mashilo Modiba, PhD student for Information Science at the University of South Africa (UNISA). My research title is **"Utilising artificial intelligence technology for the management of records at Council for Scientific and Industrial Research (CSIR) in South Africa"**. The purpose of the study is to investigate the utilisation of artificial intelligence technology (AIT) for the management of records at CSIR and make recommendations based on the findings. The information obtained, and the resultant recommendations may assist CSIR on the application of AIT for the management of records. Participation in this study is absolutely voluntary.

The information gathered using this questionnaire will not be used for any purpose other than for this study. You are not required to provide your name or any information that may identify you and will therefore remain anonymous. The aim of the questionnaire is to evaluate your opinion, perception and attitude towards the utilisation of AIT for the management of records at CSIR. The results of the study will be used to help answer unanswered questions as far as the utilisation of AIT for the management of records is concerned.

It would be highly appreciated if you could answer all questions as openly as possible. Please give your honest and sincere opinion. Your response will be helpful in reviewing the extent of the current records keeping systems and practice at CSIR and making recommendations. Please feel free to contact Mashilo Modiba for more information and enquire at 072 633 8044 or modibmt@unisa.ac.za or Prof P Ngulube at 012 429 2832 or ngulup@unisa.ac.za and Dr N Marutha at 012 429 6709 or emarutns@unisa.ac.za. I would like to thank you in anticipation for your interest and effective participation in this study.

1. Please answer questions by making a cross next to the correct answer and explain where necessary.

2. Use "N/A" for not applicable questions, please answer all questions.

3. If writing space is not enough, please use a separate page and write the question number next to the answer.

4. Please sign the consent form at the end of this questionnaire.

SECTION 1: PERSONAL DATA

1.1. Indicate your age, gender, job title and academic qualification in the table below.

AGE GROUP	
18-24	
25-30	
31-35	
36-40	
41-50	
51-55	
56-60	
65+	
GENDER	
Male	
Female	
JOB TITLE	
Records manager	
Professional repository	
Indexer	
Archives technician	
Others, specify	
QUALIFICATION	
Grade 12	
Junior degree	
Honours degree	

Master's degree	
Doctoral degree	
Others specify	

SECTION 2: LEGISLATIVE FRAMEWORK AND POLICY

2.1. Are there records management legislative framework applied by CSIR?

Yes	
No	

2.1.1. If Yes in #2.1 identify how legislative framework address the electronic records management activities? (Tick all that are applicable)

Creation of records	
Retrieval of records	
Storage of records	
Records maintenance	
Security and safety of records	
Others, specify	

2.2. If Yes in #2.1, identify any of the South African legislative framework that are used to manage the records at CSIR. (Tick all that are applicable)

The Constitution of the Republic of South Africa (Act no. 108 of 1996)	
The Public Finance Management Act (Act no. 1 of 1999 as amended)	
The Promotion of Access to Information Act (Act no. 2 of 2000)	
The Promotion of Administrative Justice Act (Act no. 3 of 2000	
The National Archives and records service of South Africa Act (Act no. 43 of 1996)	
Protection of Information Act (Act no. 84 of 1984)	
Protection of Personal Information Act (Act no. 4 of 2013)	
Electronic Communication and Transactions Act (Act no. 25 of 2005)	
Others specify	

2.3. How does the organisation apply the legislative framework in governing records at CSIR? (Tick all that are applicable)

Used for policy development	
Used for decision making	
Used for problem solving	
In developing a records management framework	
In developing electronic system	
Used to implement training for staff on records management	
Others specify	

2.4. Which gaps do you think are there in the legislative framework that is being used?

_____

_____

_____

_____

2.5. What do you think can be done to improve on the gaps identified at #2.4?

_____

_____

_____

_____

2.4. Does the organisation have a records management policy in place?

Yes	
No	

2.4.1. If Yes in #2.4, does the policy address the management of electronic records?

_____

_____

_____

_____

2.5. Identify the policy used to manage records at CSIR? (Tick all that are applicable)

CSIR records management policy	
SABC records management policy	
NRF records management policy	

Others, specify	

2.6. Which South African policies were used to develop the records management policy at CSIR? (Tick all that are applicable)

Minimum information security standards	
Records management policy manual	
Privacy policy	
Managing electronic records in governmental bodies: policy, principle and requirements	
Others, specify	

2.7. Please indicate which activities are covered by the CSIR records management policy? (Tick all that are applicable)

Records receiving	
Records preservation and conservation	
Records maintenance and use	
Records disposal	
Others, specify	

2.8. Which gaps do you think are there in the CSIR records management policy?

_____

_____

_____

_____

2.9. How do you think the gaps identified in the CSIR records management policy may be bridged?

_____

_____

_____

_____

SECTION 3: STATE OF RECORDS MANAGEMENT AT CSIR

3.1. In which format are records managed at CSIR?

Manually	

Electronically	
Both	
Others, specify	

3.1.1. As per your answer at #3.1, how effective is the format in which records are managed at CSIR?

_____

_____

_____

_____

3.2. How are records created at CSIR?

Manually	
Electronically	
Both	
Others, specify	

3.2.1. As per your answer at #3.2, how effective are records created at CSIR?

_____

_____

_____

_____

3.3. How are records stored at CSIR?

Shelves	
Electronic records management system	
Both	
Others, specify	

3.3.1. As per your answer at #3.3, how effective are records stored at CSIR?

_____

_____

3.4. How are records accessed by users at CSIR? (Tick all that are applicable)

In person	
Telephonically	
Email	
Others, specify	

3.4.1. As per your answer at #3.4, which method of accessing records is effective at CSIR?

3.5. How are records retrieved at CSIR? Briefly explain the process.

3.6. How long does it take to retrieve records at CSIR?

5-10 minutes	
10-30 minutes	
30- 1 hour	
1 hour+	

3.7. How is the state of the records at CSIR?

Good	
Bad	
Others, specify	

3.7.1. Rate CSIR current state of records at CSIR in terms of the following items? Please put a cross (X) in the column that describes your response using the following scale: 1 = Agree; 2 = Unsure; 3 = Disagree.

STATEMENT	1	2	3
Records are in good condition			
records are well stored			
Records are easily accessed			
Records are easily retrieved			
Records are maintained			
Records are easily disposed			
Records are saved and protected			

Note: The records classification system is a block numeric plan for organising records so they can be found when they are needed. It represents a menu from which staff can select the appropriate classifications for records and files throughout the corporation (Mokhtar & Yusof 2017).

3.8. Do you know any classification system applied for the management of records at CSIR?

Yes	
No	

3.8.1. Identify the nature of classification system used if available at CSIR. (Tick all that are applicable)

General to specific classification system	
Alphabetical classification system	
Numeric classification system	
Alpha-numeric classification system	
Others, specify	

Note: Records maintenance is the process that includes a regular check on the state of records. Records that are damaged would then be fixed so that they would again be useable or such records would then be disposed of (Duranti & Rogers 2019).

3.9. Does CSIR maintain their records?

Yes	

No	

3.9.1. Explain the nature of records maintenance if available at CSIR.

_____

_____

_____

_____

3.9.2. If your answer is yes at #3.9, how often are records maintained at CSIR?

Weekly	
Monthly	
Annually	
Others, specify	

3.9.3. What do you do when you are maintaining your records? Briefly explain the process.

_____

_____

_____

_____

10. Does the organisation have any security measures in place for the protection of records?

Yes	
No	

10.1. What kind of security measures that are in place to protect records at CSIR? (Tick all that are applicable)

Use of bibliometric system to access the records	
Records office only accessible to records practitioners	
Completion of a register before accessing records	
Others, specify	

11. Does CSIR have back up system for records?

Yes	
No	

11.1. How are records backed up at CSIR? Briefly explain the process.

_____

_____

_____

_____

12. Does CSIR have disaster management plan in place?

Yes	
No	

12.1 Does CSIR's disaster management plan cover records?

_____

_____

_____

_____

13. How are records dispose of? Briefly explain the process.

_____

_____

_____

_____

SECTION 4: RECORDS MANAGEMENT ACTIVITIES

4.1. Rate CSIR current records management activities in terms of the following items?

Please put a cross (X) in the column that describes your response using the following

scale: 1 = Good; 2 = Unsure; 3 = Poor.

STATEMENTS	1	2	3
1) CSIR records have effective storage capacity			
2) CSIR records have effective retrieval capacity			

3) CSIR have reliable records backup system			
4) CSIR have effective records classification			
5) CSIR have records access control and measurement			
6) CSIR have reliable records movement tracking system			
7) CSIR have records safety and security measures			
8. CSIR have effective disposal systems			

4.1.1. Please elaborate your answer for each statement at #4.1.

STATEMENT	ELABORATION
1) CSIR have effective records storage capacity	
2) CSIR have effective records retrieval capacity	
3) CSIR have reliable records backup system	
4) CSIR have effective records classification	
5) CSIR have records access control and measurement	
6) CSIR have reliable records movement tracking system	
7) CSIR have records safety and security measures	

8. CSIR have effective records disposal systems	

4.2. Please indicate whether you agree, unsure or disagree with the following statements about the effectiveness of the current records management system at CSIR. Please put a cross (X) in the column that describes your response using the following scale: 1 = Agree; 2 = Unsure; 3 = Disagree.

STATEMENTS	1	2	3
1) The records storage capacity is adequate.			
2) Filing equipment is adequate.			
4) Records backup system is available.			
5) Records classification system is easy to use			
6) Records disposal system is adequate.			
7) Records safety are adequate.			
8) Records security measures are adequate.			
9. The system provide effective disposal of records			

SECTION 5: USER PERCEPTION ON ARTIFICIAL INTELLIGENCE TECHNOLOGY FOR RECORDS MANAGEMENT

Note: Artificial intelligence refers to a programmed robotic machines and computer programmes that are capable of automatically carrying out a complex series of actions in the field of archives and records management (Iron Mountain 2019a).

5.1. What do you think artificial intelligence is? (Tick all that are applicable)

Artificial intelligence refers to robotic machines	
Artificial intelligence refers to cloud computing	
Artificial intelligence refers to blockchain technology	
Artificial intelligence refers to big data	
Artificial intelligence refers to internet of things	

Artificial intelligence refers to web of things	
Others, specify	

5.2. Are you familiar with the application of artificial intelligence technology for the management of records?

Yes	
No	

5.2.1. If your answer is Yes at #5.2 what is your understanding about the application of artificial intelligence technology for the management of records? (Tick all that are applicable)

Artificial intelligence manages records effectively	
Artificial intelligence provides retrieval of records	
Artificial intelligence store records effectively	
Artificial intelligence provides security for the records	
Others, specify	

5.2.2. If your answer is No at #5.3 what do you think should be done for you to familiarise with the application of artificial intelligence technology of records? (Tick all that are applicable)

Attending workshops on artificial intelligence	
Attending conferences on artificial intelligence	
Attending training on artificial intelligence	
Studying on artificial intelligence	
Writing papers on artificial intelligence	
Others, specify	

5.3. Is CSIR already implementing artificial intelligence for the management of records?

Yes	
No	

5.3.1. If No in #5.3, is the organisation having plans to implement artificial intelligence technologies for the management of records?

_____

_____

_____

_____

5.4. Which improvement to the management of records do you think artificial intelligence can bring to CSIR if properly implemented? (Tick all that are applicable)

Easy digitisation of records	
Easy retrieval of records	
Effective storage of records	
Effective protection records	
Others, specify	

5.5. What are your general views about the application of artificial intelligence technology for the management of records at CSIR? (Tick all that are applicable)

Artificial intelligence will provide effective records management at CSIR	
Records will still not effectively be managed at CSIR	
Records practitioners will lose their jobs if artificial intelligence is applied at CSIR	
Others, specify	

6. USABILITY OF ARTIFICIAL INTELLIGENCE TECHNOLOGY FOR RECORDS MANAGEMENT

6.1. State whether you agree, unsure or disagree with the statements below about improvements that artificial intelligence technology can bring in the management of records at the CSIR? Please put a cross (X) in the column that describes your response using the following scale: 1 = Agree; 2 = Unsure; 3 = Disagree.

STATEMENTS	1	2	3
1) Records will be managed effectively			
2) Provide reliable storage facility			
3) Facilitate adequate records classification			
4) Provide adequate maintenance of records			
5) Provide adequate security and movement tracking of records			

6) Provide effective disposal of records			

6.2. To which function do you think artificial intelligence should be applied in the management of records at CSIR? (Tick all that are applicable)

Records creation	
Records retrieval	
Records classification	
Records storage	
Records maintenance	
Records movement tracking and safety	
Records disposal	
Others, specify	

6.2.1. Please provide your general view for your answer (s) at #6.2.

_____

_____

_____

_____

SECTION 7: ARTIFICIAL INTELLIGENCE INFRASTRUCTURE

7.1. Do you know any artificial intelligence infrastructure used for records management?

Yes	
No	

7.1.1. If your answer is yes at #7.1, which artificial intelligence infrastructure are suitable for the management of records do you know below? (Tick all that are applicable)

Deep learning	
Neural network	
Black box	
Automated rules	
Machine learning	

Automated classification	
Natural language processing	
Others, specify	

7.1.2. If your answer is no at #7.1, what do you think should be done to familiarise yourself with the artificial intelligence infrastructure that are used for the management of records?

_____

_____

_____

_____

7.2. State whether you agree, unsure or disagree that artificial intelligence infrastructure used for records management is effective in the below records management activities. Please put a cross (X) in the column that describes your response using the following scale: 1 = Agree; 2 = Unsure; 3 = Disagree.

STATEMENTS	1	2	3
1) Artificial intelligence infrastructure is effective in records creation			
2) Artificial intelligence infrastructure is effective in storing records			
3) Artificial intelligence infrastructure is effective in records classification			
4) Artificial intelligence infrastructure is effective for records maintenance			
5) Artificial intelligence infrastructure provides effective records movement and security			
6) Artificial intelligence infrastructure effectively disposes records			

7.2.1. Please elaborate your answer for each statement for at #6.2.

STATEMENT	ELABORATION
1) Artificial intelligence infrastructure is effective in records creation	

2) Artificial intelligence infrastructure is effective in storing records	
3) Artificial intelligence infrastructure is effective in records classification	
4) Artificial intelligence infrastructure is effective for records maintenance	
5) Artificial intelligence infrastructure provides effective records movement and security	
6) Artificial intelligence infrastructure effectively disposes records	

7.3. Which electronic records management equipment do you have at CSIR to manage records? (Tick all that are applicable)

Robotic machine	
Database	
Internet	
Servers	
network	
Website	
Computers	
Computer equipment	

Others, specify,	

SURVEY QUESTIONNAIRE INFORMED CONSENT FORM

INFORMED CONSENT FORM
"UTILISING ARTIFICIAL INTELLIGENCE TECHNOLOGIES FOR THE MANAGEMENT OF RECORDS AT THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH IN SOUTH AFRICA"

I am Mashilo Modiba and a PhD (Doctoral) student for Information Science at the University of South Africa (UNISA). I am conducting a research study on *"Utilising artificial intelligence technologies (AIT) for the management of records at CSIR in South Africa"*. The purpose of the study is to investigate the utilisation of AIT for the management records at CSIR in South Africa. The information obtained, and the result recommendations could assist CSIR in the effective and efficient management of records. Participation in this study is absolutely voluntary.

The information in this questionnaire will not be used for any other purpose than for this study. You are not required to provide your name and will therefore remain anonymous. The aim of the questionnaire is to evaluate your opinion, perceptions and feeling about the utilisation of AIT in the management of records at the CSIR. The results of the study will be used to help answer unanswered questions as far as the application AIT for the management of records is concerned. Other possible benefits for participating in this study are as follows: opportunity to share your experiences, contribute to knowledge and records management improvements programmes. It is on these bases that the researcher is requesting you as the study participant to give consent through this form for your participation in the study. Should you have any question or seek any clarity, feel free to ask the researcher at any time of your participation at modibmt@unisa.ac.za or 072 633 8044 or the supervisors, Prof P Ngulube at 012 429 2832 or ngulup@unisa.ac.za and Dr N Marutha at 012 429 6709 or emarutns@unisa.ac.za.

I hereby give consent for me to participate in this study and that the information I provide in the questionnaire will be used for accomplishment of this research project. The information provided will be treated with high degree of confidentiality as stated in

this consent form and will therefore remain anonymous. Please put a cross (X) next to the following question.

- I need to receive copy of research report summary in completion of the study

Yes

No

_____   _____

Participant signature   Date

Thank you very much for your participation!!

INTERVIEW SCHEDULE FOR THE RECORDS MANAGER AND PORTFOLOI MANAGER AT THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

"UTILISING ARTIFICIAL INTELLIGENCE TECHNOLOGY FOR THE MANAGEMENT OF RECORDS AT THE COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH IN SOUTH AFRICA"

ANSWER THIS INTERVIEW QUESTIONS AS GUIDED BELOW

1. Please respond to only asked questions.

2. Answer also follow up questions.

3. Please sign the consent form at the end of this interview.

SECTION 1. INTERVIEW DETAILS

1.1. Interviewer:

1.2. Date:

1.3. Time:

1.4. Place:

1.5. Mode of interview:

SECTION 2. DEMOGRAPHIC INFORMATION

2.1. What is your gender?

2.2. What is your job title or position at CSIR?

2.3. What is your role at CSIR?

2.4. How long have you been working at CSIR?

_____

_____

_____

_____

2.5. What is your highest academic qualification?

_____

_____

SECTION 3: LEGISLATIVE FRAMEWORK FOR RECORDS MANAGEMENT AT CSIR

3.1. How are the legislative framework applied at the CSIR for the management of records?

_____

_____

_____

_____

3.2. Which legislative framework are used at CSIR to manage records?

_____

_____

_____

_____

3.3. Why are those legislative frameworks used to manage records at CSIR?

_____

_____

_____

_____

3.4. Is there any gap in the legislative framework used for records management at CSIR? Give a brief explanation.

_____

_____

_____

_____

3.5. How do you think CSIR can improve on the gaps on the legislative framework used to manage records?

_____

_____

_____

_____

SECTION 4: POLICY FRAMEWORK FOR RECORDS MANAGEMENT AT CSIR

4.1. How are policies applied when managing records at CSIR?

_____

_____

_____

_____

4.2. How did the CSIR developed its records management policy? Briefly explain the process.

_____

_____

_____

_____

4.3. Why is the records management policy important at CSIR?

_____

_____

_____

_____

4.4. Is there any gap in the records management policy at CSIR? Give a brief explanation.

_____

_____

_____

_____

4.5. How do you think CSIR can improve on the gap on the policy used to manage records?

_____

_____

SECTION 4: STATE OF RECORDS MANAGEMENT

4.1. In which format are records managed at CSIR?

4.2. How are records created?

4.3. How are records stored at CSIR?

4.4. How are records retrieved at CSIR?

4.5. How are records managed at CSIR?

4.6. How are records accessed at CSIR?

4.7. How long does it take to retrieve records at CSIR?

_____

_____

_____

_____

4.8. How is the condition of the records?

_____

_____

_____

_____

Note: The records classification system is a block numeric plan for organising records so they can be found when they are needed. It represents a menu from which staff can select the appropriate classifications for records and files throughout the corporation (Mokhtar & Yusof 2017).

4.9. How are records classified at CSIR?

_____

_____

_____

_____

4.10. Which classification system do you use at CSIR?

_____

_____

_____

_____

Note: Records maintenance is the process that includes a regular check on the state of records. Records that are damaged would then be fixed so that they can again be useable or such records would then be disposed of (Duranti & Rogers 2019).

4.11. How are records maintained at CSIR?

_____

_____

_____

_____

4.12. How often are records maintained at CSIR?

_____

_____

_____

_____

4.13. Which security measures do you have in place for the protection of records at CSIR?

_____

_____

_____

_____

SECTION 5: RECORDS MANAGEMENT ACTIVITIES

5.1. Which records management system is CSIR using to manage their records?

_____

_____

_____

_____

5.2. What are the challenges of the current records management system?

_____

_____

_____

5.3. Which records management activities are managed through the current records management system?

_____

_____

_____

_____

SECTION 6: USER PERCEPTION ON ARTIFICIAL INTELLIGENCE TECHNOLOGY AT CSIR

Note: Artificial intelligence refers to a programmed robotic machines and computer programmes that are capable of automatically carrying out a complex series of actions in the field of archives and records management (Iron Mountain 2019a).

6.1. What do you think artificial intelligence is? Give a brief explanation.

6.2. What is your understanding about the application of artificial intelligence technology for the management of records at CSIR?

6.3. Do you think artificial intelligence will be effective if properly implemented at CSIR?

6.4. Which improvement do you think artificial intelligence can bring to CSIR if properly implemented?

6.5. What are your general opinions regarding the concept artificial intelligence for the management of records at CSIR?

_____

_____

_____

_____

SECTION 7: USABILITY OF ARTIFICIAL INTELLIGENCE AT CSIR

Note: Artificial intelligence is used to manage records because they are quicker than human intelligence. What a human intelligence can achieve in hours; artificial intelligence can perform in minutes (Ripcord company 2018).

7.1. Identify the records management activities can be managed through artificial intelligence technologies at CSIR?

_____

_____

_____

_____

7.2. How are those records management activities at 7.1 in your view should be managed through artificial intelligence at CSIR?

_____

_____

_____

_____

7.2. Why are those records management activities at 7.1 should be managed through artificial intelligence at CSIR?

_____

_____

_____

_____

SECTION 8: ARTIFICIAL INTELLIGENCE INFRASTRUCTURE

Note: Artificial intelligence infrastructure refers to automatic classification system, machine learning, natural language processing, automated rules, black box, neural networks and deep learning that are embedded in robotic machines (Woodword 2018).

8.1. How is artificial intelligence infrastructure used to manage records?

_____

_____

_____

_____

8.2. Why are those artificial intelligence infrastructures important for the management of records?

_____

_____

_____

_____

_____

INTERVIEW INFORMED CONSENT FORM

INFORMED CONSENT FORM

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.

I hereby give consent for me to participate in this study and that the information I provide in the interview will be used for accomplishment of this research project. The information provided will be treated with high degree of confidentiality as stated in this

consent form and will therefore remain anonymous. Please put a cross (X) next to the following question.

- I need to receive copy of research report summary in completion of the study

Yes

No

_____   _____

Participant signature   Date

Thank you very much for your participation!

APPENDIX 7: DOCUMENT REVIEW CHECKLIST

DOCUMENT REVIEW CHECKLIST			
Document Title:			
Document Reviewer(s):			
	Yes	**No**	**Comments**
Availability of policies that guides the management of records?			
How is the policy used during the creation of records?			
How is the policy during the maintenance of records?			
How is the policy used during records disposal?			
How is the policy addressing the records management systems?			
How is the policy addressing the ICT for digital records?			
How does the policy address access to the records at CSIR?			
How is the policy covering the disaster management and recovery plan?			

APPENDIX 8: RECORDS MANAGEMENT SYSTEM CHECKLIST

RECORDS MANAGEMENT SYSTEM CHECKLIST			
Title:	**Review Date:**		
System Reviewer(s):			
	Yes	**No**	**Comments**
How effective is the records management system at CSIR?			
How efficient is the back-up system at CSIR?			
How secured is the records management system at CSIR?			
How is the records management system accessed by the staff at CSIR?			
How are records stored in the records management system at CSIR?			
How are records disposed in the records management system at CSIR?			
How is the system managing all the records management functions e.g. Creation, maintenance, use and disposal?			

APPENDIX 9: SURVEY OBSERVATION SCHEDULE

OBSERVATION CHECKLIST			
Title:	**Review Date:**		
Observer(s):			
	Yes	**No**	**Comments**
Does CSIR have enough staff to manage records?			
Does the management support the records management section at CSIR?			
Do records managers have adequate qualifications?			
Do records practitioners have adequate skills to manage records?			
Does CSIR create records?			
Does CSIR maintain records?			
Does CSIR dispose records?			
Are records stored safely at CSIR?			
Are records at CSIR at good condition?			
Are records retrieved easily?			
Are clients receiving records on time?			

APPENDIX 10: RESEARCH DASHBOARD

Research objectives, research questions, research methods and data collection methods

OBJECTIVES	RESEARCH QUESTIONS	THEORIES/ MODELS	RESEARCH METHODS	DATA COLLECTION METHODS
To establish the current state of records management at the CSIR in South Africa	What is the state of records management at the CSIR in South Africa?	Records life circle (creation, maintenance, use and disposition) and records continuum (create, capture, organise and pluralise)	Qualitative method (interpretive)	Observation and interviews
To evaluate the policy and legal framework for the management of records through AIT at the CSIR in South Africa	How have the policy and legal framework been used to guide the utilisation of AIT for records management at the CSIR in South Africa?	Records life circle (creation, maintenance, use and disposition) and records continuum (create, capture, organise and pluralise)	Qualitative methods (interpretive and analytic)	Document review (policies and acts)
To identify the AIT infrastructure readiness for the management of records in the CSIR in South Africa	Why is the AI infrastructure required for the management of records at the CSIR in South Africa?	Object analysis for Embedded System Theory (requirements analysis, system analysis, behavioural object analysis,	Qualitative method (descriptive, interpretive and analytic)	Records management system checklists

		structural object analysis) and AI (natural languages, neural networks, expert system and robotics)		
To examine the usability of AIT for the management of records at the CSIR in South Africa	How can AIT be used for records management at the CSIR in South Africa?	Object analysis for Embedded System Theory (requirements analysis, system analysis, behavioural object analysis, structural object analysis), Technology Acceptance Model (perceived usefulness, perceived ease of use) and artificial intelligence (natural languages, neural networks, expert system and robotics)	Quantitative and qualitative method (descriptive, interpretive and analytic)	Questionnaire to the records management practitioners and records management system checklist

To determine the records management activities that can be carried out through AIT at the CSIR in South Africa	Which records management activities may be carried out through AIT at the CSIR in South Africa?	Records life circle (creation, maintenance, use and disposition) and records continuum (create, capture, organise and pluralise)	Quantitative methods (descriptive)	Questionnaire (records clerks and practitioners)
To examine the perception of records management practitioners regarding the usage of AIT for managing records at the CSIR in South Africa	What are the perceptions of the records management practitioners regarding the utilisation of AIT for records management at the CSIR in South Africa?	Technology Acceptance Model (perceived usefulness, perceived ease of use, attitude towards using and behavioural intention to use)	Quantitative method and qualitative method (descriptive, interpretive and analytic)	Questionnaire (open and close ended questions) and interviews
To propose a framework to apply AIT for the management	What kind of framework may be proposed to apply AIT for the management of records at the CSIR in South Africa?	Artificial intelligence natural languages, neural networks, expert system and robotics), and records management	Qualitative method (descriptive)	Concepts (Artificial intelligence and records management)