Metadata creation and management in the preservation of digital information in selected libraries in Cape Town

by

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Declaration

I, Lordwick Bonang Maruping, declare that:

The research reported in this dissertation, except where otherwise indicated, is my research. This dissertation has not been previously submitted in whole, or in part, for the award of any degree. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, and has been cited and referenced.

Dedication

I dedicate this thesis to both my parent Mahlomola and Mabonang Maruping who guided me at a very young age to work hard in education. Ke a leboha batsoali baka le phomole ka Khotso hle moo leng teng!

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Abstract

Metadata describes and organizes resources in the digital environment for users to discover. Metadata plays an integral part in the digital preservation of information resources even though inadequacies exist in its creation and management. Challenges that affect creation and management of metadata are metadata quality, which results from not applying metadata standards, and non-specialists creating metadata.

The aim of study was to investigate how metadata is created and managed and the role it plays in the digital preservation of resources in selected libraries in Cape Town. The study was guided by the following research objectives: to determine how metadata is created and managed in the digital environment in selected libraries in Cape Town; to determine how metadata is managed in the digital environment in selected libraries in Cape Town; and to determine the principles and standards adopted in the creation and management of metadata in selected libraries in Cape Town.

A qualitative approach and a comparative case study design was adopted. Qualitative data was collected from a sample drawn using purposive sampling from the target population of seven metadata librarians in selected libraries in Cape Town. Qualitative data were collected from seven metadata librarians through semi-structured interviews and document analysis. Documents that were analyzed are cataloguing manual, RDA cataloguing standards, cataloguing guidelines, and OCLC guidelines in selected libraries in Cape Town. Thematic content analysis was used to analyze the qualitative data. The study used themes such as demographic information, metadata creation, metadata for digital preservation, metadata standards, metadata management and metadata challenges in digital preservation.

The findings of the study revealed that metadata librarians adhere to international standards and tools as AACR2, DDC, LCSH, Dublin Core, RDA and other standards for metadata creation and management of digital resources. The findings established that digital objects should have a unique identity number to manage the content on the digital resources. It was also found that metadata elements that are mainly created and managed in libraries are ISBN, author, title, publication information, pagination, subject headings, summary, and shelf number (call number).

Challenges in the creation and management of metadata identified included the lack of security in library systems, lack ICT skills among librarians, and the lack of information on resources to catalogue.

The overall findings revealed that metadata librarians performed descriptive metadata only in libraries. It also revealed that authority control is one of the most important management functions of metadata to ensure the effective accessibility of records. Descriptive metadata is for printed books, e-books, maps, art, journals, theses and dissertations, digital objects, and audio-visual materials such as CDs and DVDs for display and discovery by their users.

The conclusion drawn from this finding is that metadata librarians create and manage descriptive metadata and that libraries follow international standards and use internationally recognized tools when creating digital records. The study recommends that metadata librarians should be involved at all levels in the development of a new library management system (LMS). This will ensure that the lack of security in the library system should be overcome. The study also recommended that metadata librarians should get training on ICT skills that affect metadata creation and management through LIS school.

Keywords: metadata, digital resources, metadata creation and management, digital preservation of information, bibliographic descriptions, metadata standards and tools, metadata librarian

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List of acronyms and abbreviations

AACR – Anglo American Cataloguing Rules

CARL - Canadian Association of Research Libraries

DC – Dublin Core

DDC – Dewey Decimal Classification

EAD – Enclosed Archival Description

HTML - Hypertext Markup Language

ICT – Information and Communications Technology

JPEG - Joint Photographic Experts Group

LCSH – Library of Congress Subject Heading

LIS – Library Information Studies

LMS – Library Management System

LOC – Library of Congress

MARC - Machine-Readable Cataloguing

METS - Metadata Encoding Transmission Standards

MODS - Metadata Object Description Schema

NISO – National Information Standards Organization

OAIS - Open Archival Information System

RDA – Resource Description Access

SU – Stellenbosch University

TIFF - Tagged Image File Format

WCPLS - Western Cape Provincial Library Services

UCT - University of Cape Town

XML - Extensible Markup Language

Chapter One: Introduction and background to the study

1.1 Introduction

Metadata describes and organizes resources in the digital environment and allows users to discover and use the content of digital collections and repositories. According to Xie and Matusiak (2016: 129) and Riley (2017: 1) metadata is the information that is created, stored, and shared to describe things. It allows for the interaction of resources to obtain the knowledge that is required in areas such as libraries, archives, and museums (Riley, 2017: 1). The term metadata is the keyword that is used to mean finding specific information resources such as books, journal articles, and other information resources (Alemu, 2016: 312). Simply put, metadata helps users to find what information resources. According to Dashrath (2014: 210) metadata is described as data about data. In other words, metadata acts as a surrogate, on behalf of the content, context, structure, quality, provenance, condition, and other characteristics of records for the reason of representing the record to a potential user for discovery, evaluation, and well-being for usage, access, transfer, and citation (Dashrath, 2014: 210). Pal (2010: 44) points out that metadata is important for librarians in pursuing long-term management and preservation of digital objects as well as the digital archivists, database developers, and researchers of digital information. The importance of metadata is to describe, identify, use, retrieve, preserve, and promote interoperability between information management and provide access to the content of digital information as well as management (Xie and Matusiak 2016: 131). Miller (2011: 9) notes that a collection would be virtually unusable if metadata is not present. Users would have challenges discovering and accessing digital objects within the collection.

There are many challenges that affect metadata creation and management. First, is the issue of metadata quality because of growth of services that affect system operations (Vera et al. 2015: 564). Secondly, the challenges of applying metadata standards that lack largely accessible tools to understand the meaning of the data (Bunawan and Nordin, 2015: 13). Thirdly, issues of metadata creation and management where non-specialists are creating metadata that are not standard (Ramesh, Vivekavardhan and Bharathi, 2015: 195). This amounts to the creation of metadata that does not adhere to standards. Lastly, data volume affects the

operational transactional database server (Vera et al. 2015: 565). The focus of this study is on the third listed challenge which is the creation and management of metadata.

1.2 Types of metadata and metadata standards

Riley (2017:6) classifies metadata into three types namely: administrative, descriptive, and structural metadata. Administrative metadata deals with the management of information about resources, such as when and how a resource is created. Descriptive metadata describes the content by using elements such as title, author, and subject. Structural metadata shows how information about resources is linked together in terms of relationships. For example, book pages must relate to one another (Riley, 2017: 6). Structural metadata must store technical details around the file, structure, how to utilize it, review data around what actions have been made to it, confirmation of authenticity, and rights as well as tasks for performing activities on the object (Troselius and Sundqvist, 2012: 10).

According to Dashrath (2014: 211-212), metadata standards include Dublin Core (DC), Metadata Object Description Schema (MODS), Metadata Encoding Transmission Standards (METS), Text Encoding Initiatives (TEI), Enclosed Archival Description (EAD), Machine-Readable Cataloguing Format (MARC), and Visual Research Association (VRA) and many others. A detailed discussion of the different types of metadata and metadata standards is provided in chapter two.

1.3 Statement of the problem

Metadata plays an integral part in the digital preservation of information even though inadequacies exist in its creation and management. For instance, at the stage of its creation, most of it is incomplete (Segawa, 2015: 3). Ramesh, Vivekavardhan and Bharathi (2015: 195) state that librarians and indexers are called the experts in creating metadata, but lately users and publishers are also creating metadata that does not follow the standards required for metadata access and discovery. Metadata has many significant purposes such as data description, data browsing, and data transfer, and has a significant role in digital preservation and management of resources (Dashrath, 2014: 211). However, improper procedures in terms of the creation of the metadata results in difficulties in the accessibility or resource discovery (Segawa, 2015: 3). Digital preservation also depends on the availability of preserved

metadata that describes the digital object in the repository to enable its retrieval to a specific community for long-term use (Dappert and Enders, 2010: 5). The role of metadata in digital preservation is to provide direction that supports the process of long-term preservation including information provenance, intellectual property rights, and technical and interpretive environment of an archived digital object (Lavoie and Gartner, 2013: 4–5). The lack of adequate quality metadata may lead to failure in the discovery of digital information (Pal, 2010: 51). It is not known how libraries in the city of Cape Town create and management their metadata and it is also not known whether they encounter challenges in the creation and management of metadata.

1.4 Purpose of the study

This study therefore seeks to investigate how metadata is created and managed and the role it plays in the digital preservation of resources in selected libraries in Cape Town.

1.5 Objectives of the study

The study is guided by the following objectives:

- To determine how the metadata can be created for the digital environment in selected libraries in Cape Town.
- To determine how metadata is managed in the digital environment in selected libraries in Cape Town.
- To determine the principles and standards for managing metadata in selected libraries in Cape Town.

1.6 Research questions

The study is guided by the following research questions:

- How is metadata created for the preservation of digital information in libraries in Cape Town?
- What strategies are used to manage metadata for the preservation of digital information in selected libraries in Cape Town?
- What best practices must be used in metadata creation and management in selected libraries in Cape Town?
- What are the challenges in the creation and management of metadata for digital preservation in selected libraries in Cape Town?

1.7 Significance of the study

The significance of the study is to reveal how metadata is created and managed and its role in the digital preservation of information in libraries. The current study was needed by the fact that metadata management in digital environments is a vital aspect of libraries without that the libraries would be in chaos. The study contributes to existing studies on metadata creation and management. This is aimed at influencing policy changes in the selected libraries in Cape Town. From a practical perspective, the study will contribute to creating, describing, identifying, using, retrieving, preserving, sharing metadata, and managing, and providing access to the content of digital information in libraries.

1.8 Limitations and delimitations of the study

Delimitations are restrictions or constraints that a researcher faces during the journey of the research study (Du Plooy-Cilliers, Davis, and Bezuidenhout, 2014: 275).

The study focused on the creation and management of metadata for the preservation of digital information. This is because we are living in a digital era and metadata creation and management are important in the identification and retrieval of digital information. This study focused on a public and an academic library in Cape Town.

Limitations of the study refer to possible weaknesses that the researcher cannot control (Du Plooy-Cilliers, Davis and Bezuidenhout, 2014: 275). The study encountered time constraints, access to research sites, and Covid-19 restrictions. The researcher was under pressure to complete the study soon, which meant that time was limited. Access to research sites was also a challenge because not all proposed research sites granted access. COVID-19 restrictions affected data collection which led to less data being collected. All this led to the small number of participants. This was mitigated by the study being qualitative. As much as the number of respondents looks small, it is enough for a qualitative study.

1.9 Structure of this study

The study has six chapters. They are briefly explained in table 1.

Table 1: structure of the dissertation

Chapter One	Chapter One consists of the introduction and background to the study which provides the definitions and management of metadata in the digital preservation of information. The statement of the problem, the objective of the study, research questions, the significance of the study, and limitations and delimitations of the study are also provided.
Chapter Two	Chapter Two consists of the conceptual framework and literature review. The conceptual framework defines concepts metadata and digital preservation. The literature reviewed is guided by the objectives of this study and the conceptual framework. It presents literature that is aligned to metadata creation and management in the digital environment.
Chapter Three	Chapter Three presents the methodology of the study. This chapter is organized as follows: research design, research methodology, research methods, data collection, data analysis, and validity and reliability.
Chapter Four	Chapter Four provides analysis and presentation of findings from the collected data.
Chapter Five	Chapter Five provides discussions of findings.
Chapter Six	Chapter Six, the final chapter, provides summary, conclusion, recommendations of the study and identifies areas for further research.

1.10 Summary

This chapter introduced and provided the background to the study. It identified the research problem, provided the objectives and research questions of the study, outlined the significance of the study, provided the limitations and delimitations, and presented the structure of the dissertation. The following chapter presents the conceptual framework and a review of the literature.

Chapter Two: Conceptual framework and literature review

2.1 Introduction

In this chapter, the researcher presents the conceptual framework and literature review that guided the study. This chapter analyzes concepts that are relevant in the creation and management of metadata. The literature is reviewed focusing on the objectives of this study and the conceptual framework. The literature review focused on metadata creation and management in the digital environment. Before discussing the literature review, the chapter starts by discussing the conceptual framework.

2.2 Conceptual framework

Grant and Osanloo (2014: 17) describe a conceptual framework as the detailed variables identifying the relationship between the main concepts of a study. It is developed and organized in a logical structure to support a framework of the study by providing a picture of related ideas (Grant and Osanloo, 2014: 17). In other words, a conceptual framework allows a smooth path for the researcher to state and describe the concepts within the problem of the study (Luse, Mennecke and Townsend, 2012: 145). The conceptual framework will define and discuss the following concepts: metadata, types of metadata, metadata management, digital preservation, metadata for digital preservation, metadata standards, and metadata standards for digital preservation. The literature is reviewed at the end of the chapter.

2.3 Metadata

According to the National Information Standards Organization (NISO, 2010: 1), metadata is organized information that defines, describes, discovers, and makes it easy to retrieve, use or manage an information resource. Generally, metadata is defined as data about data or information about information (NISO, 2010: 1). Metadata is defined as data about data, and today it is applied in different professional

communities that design, create, describe, preserve, and use information systems and resources (Gilliland, 2016: n.p.). This study is going to adapt the definition given by O'Deegan (2014: 5) who defines metadata as information that is communicated as data about data and describes a piece of data or how it links to other data.

2.4 Types of metadata

Gilliland (2016: n.p.) classifies metadata types into three categories: administrative, structural/technical, and descriptive metadata. The following section discusses the three types of metadata.

2.4.1 Administrative metadata

According to Riley (2017: 6), administrative metadata is an umbrella term that discusses the information required to manage an object in terms of its creation. Gilliland (2016: n.p.) describes the role of administrative metadata as managing and organization of information resources such as acquisition and appraisal, rights, documentation authority, information of location and digital preservation. Administrative metadata provides information that helps manage a resource such as when, how and by whom it was created (Dashrath, 2014: 210). According to Otto (2014: 2), administrative metadata plays a significant part in the preservation of digital resources and plays a critical role for long-term preservation.

2.4.2 Technical/structural metadata

Technical metadata is important for the long-term preservation and management of mainly audiovisual resources. Technical metadata is normally defined as metadata recording the creation and qualities of digital files (Otto, 2010: 4). Technical metadata is obtained from digital objects and facilitates the automated processing of those resources (Mitchell, 2015: 106). According to Gilliland (2016: n.p.), technical metadata demonstrates how information is connected to system functions or how metadata performs. Riley (2017: n.p.) describes technical metadata in terms of technical information that contains properties such as file type, file size, and date of creation, for instance hardware and software documentation, and tracking of systems. Technical metadata consists of a basic technical element that may illustrate a moving image's size and shape. The information about the image is documented, which include speed at which the images follow each other in a grouping when introduced, any additional audio, and the overall duration of the sequence (Otto, 2010: 5). Therefore, technical

metadata requires characteristics about the object such as width, height, and depth of an image as well as identifying the format (Hutchins, 2012; PREMIS, 2012; Allasia et al., 2014).

2.4.3 Descriptive Metadata

Descriptive metadata contains information such as the title of a book, author, publication dates, description, summary, locations, and other descriptive information (Ramesh, Vivekavardhan and Bharath, 2015: 195-196). Descriptive metadata consists of two models; separate metadata model and embedded metadata model (Ramesh, Vivekavardhan and Bharath, 2015:195-196). Separate metadata model describes the metadata that is stored in a database and connected to a resource, whereas embedded metadata model describes metadata based on web pages (Ramesh, Vivekavardhan and Bharath, 2015:195-196). The study focuses on both models of metadata.

2.5 Metadata creation

According to Xie and Matusiak (2016: 155), the creation of metadata consists of procedures such as:

- Determining resource characteristics;
- Transcribing available descriptive information;
- Conducting subject analysis;
- Selecting appropriate terms from a designated controlled vocabulary tool, content guidelines for data entry;
- Recording administrative and preservation information;
- Adhering to the established standards.

Therefore, these procedures come with experienced metadata librarian to create metadata for resource.

In the 21st century, technological advances have allowed a huge amount of metadata creation, processing, sharing, transfer, and discovery of digital content (Riley, 2017: 40).

2.6 Principles for Metadata Creation and Maintenance

Metadata creation primarily became necessary for libraries and was managed by professionals such as cataloguers and indexers. Professionals are responsible for the

quality of metadata (Pal, 2016: 115). Quality metadata creation involves the process of maintenance, preservation, handling, and dissemination of collections. Metadata creation is an important building block in aiding valuable resource discoverability, access, and sharing across every growing digital collection (Park and Tosaka, 2010: 104). Metadata records begins their life cycle at appropriate various stages through the institutions where they are created and how users, researchers, and scholars access the record (Gilliland, 2016: n.p). Quality metadata creation is very crucial to the access and preservation of digital library collections including cultural heritage collections and scholarly publications in digital repositories (Xie and Matusiak, (2016: 129).

2.7 Metadata management

According to Haynes (2018: 164), the management of metadata can be understood in steps or stages in the lifecycle as an information resource. Metadata serves many important purposes in digital information management such as accessibility, interoperability, multi-versioning, rights management, preservation, and system improvement (Dashrath, 2014: 211). According to the European Commission (2014: 11), metadata is managed to guarantee the process of availability, quality, consistency, and persistence. Metadata has a significant role to perform in the management, discovery, and dissemination of resources in cultural heritage organizations (Phillips, 2020: 8). The same author describes academic libraries as institutions that manage diverse types of metadata through their in-house library system.

2.8 Digital preservation

Digital preservation is a sequence of controlled activities required to guarantee constant access to digital resources for as long as necessary (Gesek, 2019: 3). Digital preservation includes the entirety of the exercises that are accepted by a digital curator to guarantee that the digital content for which the digital curator is accountable is maintained in usable formats across ages of technology and can be made accessible in a significant manner to current and future users (Liebetrau, 2010: 40). According to Rosa (2017: 7), digital preservation is a set of exercises or endeavors made to guarantee long-term access to important digital information in the future for people. Digital preservation is a crucial part of the administration of information and

organizations that are in the cultural heritage sector such as libraries, repositories, and archives. These safekeeping organizations are always looking for approaches to integrate digital preservation into their consistent practices (Segawa, 2015: 7). Xie and Matusiak (2016: 255) describe digital preservation as containing born digital objects as well as those transformed from analog format through the digitization process. Digital preservation is a basic part of digital curation and digital stewardship (Xie and Matusiak, 2016: 258). According to Segawa (2015: 8), policy and strategy play an important part in the digital preservation of objects as they are supposed to put effective procedures to guarantee the retention of authentic and accessible digital objects. Therefore, a digital preservation strategy embraces the conversion of deteriorating analog materials to create quality duplicates for preservation purposes (Xie and Matusiak, 2016: 260). However digital preservation activities exercise the preservation of the digital assets created due to digitization just as born-digital materials as well (Xie and Matusiak, 2016: 260).

2.9 Metadata standards

The international Organization for Standardization (ISO, 2015: n.p.) defines standards as a document that provides requirements, specifications, guidelines, or characteristics that can be employed most of the time to guarantee that materials, products, processes, and services are appropriate for their objective. Metadata standards are designed to create the procedures for understanding effective metadata gathering, creation, and management as well as for enhancing the value of metadata (Qarabolaq et al., 2013: 401). According to Haynes (2018: 50) standards are a significant instrument for managing the quality of metadata about information resources. The following section will discuss major metadata standards such as Dublin Core (DC), Preservation Metadata: Implementation Strategies (PREMIS), Machine Readable Cataloguing (MARC), Metadata Object Description Schema (MODS).

2.9.1 Dublin Core

The Dublin Core Metadata Initiative (DCMI) also known as Dublin Core was crafted to describe and improve the discoverability of web and digital resources (DCMI, 2012: n.p). The standard is adopted for metadata through library institutions and the information field to allow interoperability among the systems for the exchange of information (DCMI, 2015: n.p.). According to Xie and Matusiak (2016: 133) the application of Dublin Core is used for communities such as libraries, archives, and

museums. The mission of the DCMI is to set up shared development in the metadata model, support the creation of metadata and best practices discovery of digital objects as well as to facilitate interoperability (DCMI, 2015: n.p). Dublin Core metadata standard consists of two groups: simple (unqualified) Dublin Core and qualified Dublin Core (Vegi et al. 2013: 270). Simple Dublin Core defines the usage of fifteen Dublin Core metadata elements (Nilsson, 2010: 19) and qualified Dublin Core has seventeen elements (Penalvo et al., 2010: 14). Dublin Core is not restricted standard allows the usability of controlled vocabularies to generate the content of the data elements (Haynes, 2018: 52).

2.9.2 Metadata Object Description Schema (MODS)

Metadata Object Description Schema (MODS) is a schema that was developed from MARC 21 which has been established for resource discovery through the internet (Library of Congress, 2015). MODS is an Extensible Markup Language (XML) schema for bibliographic element sets that could be used for different functions within communities such as libraries, archives, and museums (Library of Congress, 2019a). Library of Congress, (2019b) describes the structures of MODS as articulated using the XML schema language of the World Wide Web Consortium. XML supports markup for documents and allows the process of linking flexibility and detail than Hypertext Markup Language (HTML). Employing XML schema language, MODS identifies key elements, child elements, and attributes of elements such as a sub-element. Content of elements is required to avoid mixed content by allowing different levels of elements that would respond with elements that hold characteristics of metadata to spread with child elements (Library of Congress, 2019b). MODS, just like MARC 21 adopts the International Standard Bibliographic Description (ISBD) punctuation in creating MODS records. It allows punctuation to be kept if it occurs within an element and is dropped among the elements. Extensible Stylesheet Language Transformation (XSLT) stylesheet is designed for ISBD display from the MODS elements and metadata (Library of Congress, 2019b).

2.9.3 Machine Readable Cataloguing (MARC)

MARC was developed in 1968 at the Library of Congress to issue the information on catalogue cards to libraries in machine-readable form (Riley, 2017: 27). Machine Readable Cataloguing (MARC) standards are the number of digital formats for describing resources and metadata including bibliographic information in machine-

readable form (Library of Congress, 2020: n.p). MARC formats are different implementations of ISO 279 and maintained by the Library of Congress as MARC21 format (Riley, 2017:27). MARC21 is comprised of five formats such as MARC21 Bibliographic, MARC21 Authority, MARC21 Holdings, MARC21 Classification, and MARC21 Community Information. It also consists of several hundred fields such as several types of titles, authorship of works, edition, publication information, physical description, series, notes, subject, and genre terms (Riley, 2017: 28). MARC is employed to catalog books, audiovisual materials, sound recordings, computer files, and archival materials (Baca, 2017: 20). The MARC Authority format consist of assigned person name or occupation, corporate body, and subject form, it includes fields for encoding forms. MARC 21 collaborates with a set of rules used to create the above metadata fields such as Anglo-American Cataloguing Rules (AACR2) and employs MARC tags as well to create a record (Library of Congress, 2014).

2.10 Metadata standard for digital preservation

The growth and implementation of open standards proved to be important to progress in digital preservation. Digital preservation consists of two standards that are crucial and well-recognized. They are the Open Archival Information System (OAIS) reference model and the Preservation Metadata: Implementation Strategies (PREMIS) metadata standard (Xie and Matusiak, 2016: 270). The following section will discuss two digital preservation such as OAIS and PREMIS.

2.10.1 Open Archival Information System (OAIS)

The OAIS reference model defines a framework with a common vocabulary and offers a practical and information model for the preservation community (Dappert and Enders, 2010: 5). According to Gartner and Lavoie (2013: 9), the OAIS reference model was developed by Consultative Committee for Space Data Systems (CCSDS, 2012) as a conceptual framework describing an archival system and information objects linked with a system devoted to preserving digital materials. Furthermore, OAIS was accepted as ISO Standard 14721 in 2002, however even before then, the model benefited and received widespread approval in the digital preservation community (Gartner and Lavoie, 2013: 9). The primary purpose of this model is to make it significantly broader understanding of what is needed to preserve and access information for the long-term use (CCSDS, 2012:2-1). The OAIS information model is playing a critical role as the foundation for the preservation process and informing the

progress of most preservation metadata initiatives (Gartner and Lavoie, 2013: 9). Figure 2.1 below shows OAIS Functional Entities.

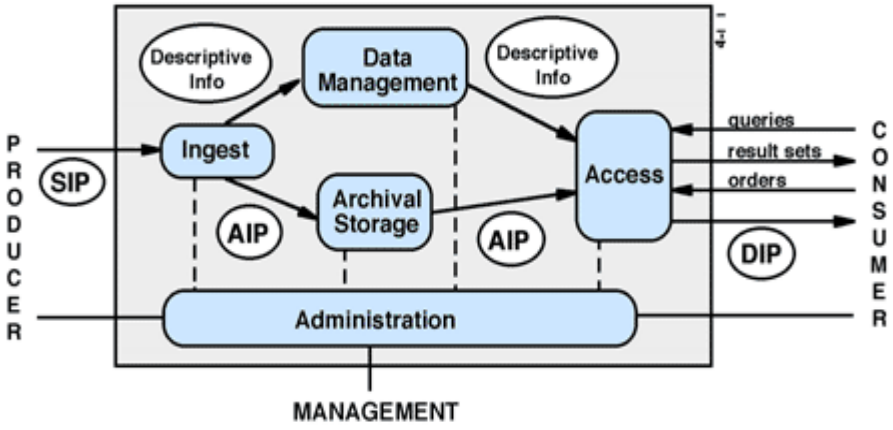

FIGURE 2.1: OAIS Functional Entities (CCSDS, 2012:4-1)

It consists of six main entities namely: Preservation Planning, Data Management, Archival Storage, Administration, Ingest, and Access, and shows information flows by lines between them (CCSDS, 2012:4-1). OAIS functional entities describe both the access and preservation aspects of ingesting digital objects and associated descriptive information into a repository for long-term storage (Xie and Matusiak, 2016: 270). The OAIS model is the heart and reliable framework for processes of metadata curation and metadata preservation (Jeng, et al., 2017: 626).

2.10.2 Preservation Metadata: Implementation Strategies (PREMIS)

Preservation Metadata: Implementation Strategies (PREMIS) is a metadata standard that supports the preservation of digital objects (Library of Congress, 2019a). PREMIS consists of a Working Group that produced a report called PREMIS Data Dictionary to support long-term digital preservation (Gartner and Lavoie, 2013: 12). Dappert and Farquhar (2016: 107) state that PREMIS Data Dictionary is a de-facto standard that presents metadata about the digital object to be preserved in repositories. PREMIS Data Dictionary is now recognized as the de facto standard for preservation metadata (Dappert and Farquhar 2016: 26). PREMIS was established to support the community with a collective data model for structuring and thinking about preservation (Dappert et al. 2016:27-28). According to Dappert et al. (2016:28), challenges in preserving digital objects provided by introducing another technological environment might be great for anyone with the task to preserve and process digital objects, and it gives

instructions for operations. The standard is employed in digital preservation metadata around the globe, and support for PREMIS is integrated into a few commercial and open-source digital preservation tools and systems (Library of Congress, 2019a). PREMIS is proposed to define properties of digital content necessary to support the digital preservation process, track preservation actions taken, and record information about the preservation metadata role (Riley, 2017: 35). PREMIS is issued on XML schemas to boost the implementation of the Data Dictionary in digital preservation systems (Library of Congress, 2015:1b). According to PREMIS Data Dictionary version 3.0 (2015: 6), it outlines semantic units. Every single semantic unit outlined in the Data Dictionary is mapped to an entity that is structured within a simple data model.

The following section presents the reviewed literature.

2.11 Literature review

The previous section discussed the conceptual framework that was relevant for the study.

The literature review is a most effective process that includes seeking, analyzing, assessing current literature (du Plooy-Cilliers, Davis and Bezuidenhout, 2014: 101). It helps the researcher determine what has been conducted previously on a topic (Bless, Higson-Smith and Sithole, 2013: 20).

This chapter reviews literature that has been conducted on previous studies metadata creation and management. This literature review is based on the objectives of the study.

2.11.1 Metadata creation

This section covers metadata creation for the digital environment in different institutions such as libraries, archives, and museums.

Several studied have been conducted to investigate metadata creation. Segawa (2015: 39) conducted a survey at a library study in the Netherlands which aimed to assess the e-depot's tools and guidelines for the creation of metadata. The results of the survey reveal that different schemas such as METS, MODS, and PREMIS were used by the library to support their guidelines in the creation of metadata and its management (Segawa, 2015: 40). A study by Chandrappa and Harinarayana (2018:

87) at the University of Mysore Library, in Mysuru revealed that metadata standards are used as a guideline for the creation of metadata of library records.

Banjade (2016: 67) conducted a study at Nepalese university library to assess the process of metadata creation. Findings revealed that the creation of copy and traditional cataloguing was practiced in Nepal universities' libraries (Banjade, 2016: 34).

Eugui (2012: 33) conducted a study to investigate metadata creation at three Norwegian institutions. The result of this study revealed that staff faced difficulties during the metadata creation process because they found numerous unclear metadata concepts, a lack of skills to determine what metadata elements were suitable for staff and users, a lack of information on the digitized collections, and the lack of necessary qualifications and skills for the staff to perform (Eugui, 2012: 43).

Park and Tosaka (2010: 113) conducted a survey study at academic libraries in the United States of America (USA) to investigate the reasons institutions fail to share their locally created metadata. The results found that some USA institutions lack the budget, had personnel and technical challenges which affected the creation and sharing of metadata for the local environment (Park and Tosaka, 2010: 113).

Tarver, Zavalina and Phillips (2016: 7) conducted a survey study at the University of North Texas (UNT) Libraries in the United States of America to investigate their metadata creation policies in digital collections. The findings revealed that the university library's technical infrastructure for metadata creation is supported by policies that promote open development and sharing of data.

Klungthanaboon (2010: 31) conducted a survey study in archives, libraries, and museums in Norway to assess the current state of metadata creation for digital photographic collections. With respect to metadata creation, the findings revealed that archivists are a major group of metadata creators, followed by curators, and lastly cataloguers (Klungthanaboon, 2010: 45).

In South Africa, Monyela (2019: i) investigated the creation of metadata in Cape Town Metropolitan public libraries with the intention of gaining an understanding the necessity of cataloguing standards in generating bibliographic information for the libraries. The studies suggested that the cataloguers should follow international

cataloguing rules when creating metadata (Monyela, 2019: 121). Furthermore, the findings revealed that cataloguers checked the whole library database to see whether the records were available or not before creating a record to avoid duplication (Monyela, 2019: 121). The literature reveals several issues; the metadata creation process, those responsible for metadata creation, metadata standards, and challenges faced when creating metadata. The following section discusses practices in the preservation of digital information in different institutions such as libraries and archives.

2.11.2 Practice in the preservation of digital information

This section covers practices in the preservation of digital information in different institutions such as libraries and archives.

Anyaku, Echedom and Baro (2019: 42) investigated different digital preservation practices adopted in institutional repositories (IRs) in Africa for preserving digital information. The findings of the study presented that most of the IRs in Africa employed digital preservation policies to control the application of digital preservation for the IR content, whereas others are in the planning process (Anyaku, Echedom and Baro, 2019: 57). Sigauke and Nengomashe (2011: 7) conducted a survey study on preservation strategy or policy which exists for digitized historical records at National Archives of Zimbabwe (NAZ) in Zimbabwe. The findings revealed a need for NAZ to develop a digitization policy for historical records because it is significant and must be developed as soon as possible for deteriorating historical records that can be protected from the worsening conditions in archival storage in Zimbabwe (Sigauke and Nengomashe, 2011: 11).

Sambo, Omeluzor and Usman (2014: 12) investigated survey libraries in Nigeria to assess digital preservation policy and the level of librarian's awareness of digital preservation strategies. The results of the investigation revealed that many libraries do not have a digital preservation policy and librarians lack expertise about digital preservation in Nigeria (Sambo, Omeluzor and Usman, 2014: 11). Matlala (2019: 99) conducted a survey study at the University of KwaZulu-Natal Archives in South Africa to assess the strategies to preserve digital records. The findings of the study revealed that the University of KwaZulu-Natal archives has been overwhelmed by digital preservation challenges such as lack of funding, lack of technical skills, lack of trained

staff, and software obsolescence (Matlala, 2019:106). Masenya and Ngulube (2019: 1) investigated academic libraries to assess practices of digital preservation in South Africa. The findings of the study showed that most academic libraries were strongly engaged in implementing digital resource programs and fully committed to digital preservation practices problems in South Africa (Masenya and Ngulube, 2019: 6). Furthermore, findings also revealed the need for skills to preserve digital records, lack of funding, poor technology, software obsolescence, copyright issue and lack of management support preservation practice in academic libraries in South Africa (Masenya and Ngulube, 2019: 8).

Soto (2015: 9) conducted a study on the digital preservation of scientific e-journals at the National Library in Colombia to assess its roles and responsibilities. The finding of the study revealed that the digital preservation of scientific e-journals at the National Library of Colombia involved many levels of practice to decrease the risk of losing digital content (Soto, 2015: 34). Osswald and Strathman (2012: 1) conducted a survey study in Germany to assess the role of libraries in curation and preservation of research data. Findings revealed that libraries and data centers are responsible although in terms of the result of the survey do not show what libraries should do in the field of digital curation and preservation in Germany (Osswald and Stratham, 2012: 3).

da Silva Junior and Borges (2017: 1) investigated the implementation of digital preservation policies at Brazilian Federal universities. The findings revealed that digital preservation policies were absent at Brazilian Federal universities (da Silva Junior and Borges, 2017: 9).

In New Zealand, the growth of digital preservation practices has been executed through the broader framework of the National Library of New Zealand's legislative mandate and strategic direction (Knight, 2010: 85). Knight (2010: 85) conducted a study to assess the program digital preservation at the National Library of New Zealand. The results were that the growth of digital preservation programs at the National Library of New Zealand involves a strategic plan, and digital preservation policy clearly defines the practice of digital preservation programmes and implementation for digital objects and required staff to perform the process (Knight, 2010: 90-94).

Li and Banach (2011: 1) conducted a survey study in the United States IRs among Association of Research Libraries (ARL) libraries to examine their practices of digital preservation policies, digital preservation strategies, rights to preserve the content, metadata quality, and sustainability. The findings revealed that preservation policies should be developed to guide the decisions about IRs content for long-term preservation (Li and Banach, 2011: 3).

Hurley and Shearer (2019: 5) conducted at the Canadian Association of Research Libraries (CARL) Digital Preservation Working Group (DPWG) for the period 2017-18, at the Canadian memory institutions in Canada, to assess current digital preservation activities and to identify gaps. The findings show that digital preservation knowledge is critical for preservation activities in the library, archives, and museum institutions in Canada (Hurley and Shearer, 2019: 47). It also involves a variety of skills and a variety of positions from managers, metadata specialists, and technicians who outline strategies and policy guidelines, systems, storage, and backup (Hurley and Shearer, 2019: 47).

The literature discussed in this section presents many issues of digital preservation. What appears to be the main issues are knowledge and skills of the digitization process and lack of policies to guide the digitization process.

2.11.3 Metadata creation and management standards

This section covers metadata creation and management standards in the preservation of digital information in different institutions such as libraries and archives.

Hart (2015:14) stated that different standards are used to create and manage metadata.

Conway and Donaldson (2010: 278) conducted a study on PREMIS implementation at the Florida Digital Archives (FDA) in the United States. Findings presented clear procedures used to manage metadata in their IRs. Brake (2012: 8) conducted a research study on PREMIS standard implementation in American archives and historical societies to assess their institutional repository that uses PREMIS to manage digital content. Findings were based on archives and historical societies in the United States showing that most responses indicated PRIMIS had not been implemented at their repository due to implementation challenges such as lack of technical and

programming knowledge, lack of preservation policy, PREMIS too detailed, lack of staff knowledge and lack of institutional support (Brake, 2012: 77-79). Furthermore, findings on the PREMIS implementation process at cultural heritage institutions in the United States showed positive results because they indicated that the PREMIS standard is the better solution to digital preservation issues (Alemneh and Hastings, 2010: 4).

Yoon and Tibbo (2011:6) conducted a study to examine the current practice for depositing data in selected data repositories with the OAIS model in the United States. Jeng, He and Chi (2017: 627) conducted a study on Interuniversity Consortium for Political and Social Research (ICPSR), the world's largest social science data repository to observe current practices in a data repository map to the OAIS environment and functional components. The findings of the study revealed the OAIS model is full-bodied and trustworthy in the practice of data curation and data preservation (Jeng, He and Chi, 2017: 627).

Ralson (2013: 4) conducted a study on the process of employing the use of the METS metadata standard whether its flexibility or its interoperability relate to the METS standard to determine. The results of the study were based on internal and external projects and consisted of archiving, ingesting/transmitting, linking, managing/storing, packaging, and structuring was incredibly significant in selecting METS standards for a project (Ralson, 2013: 21). Furthermore, results revealed that METS metadata standard for both flexibility and interoperability are important (Ralson, 2013: 21). For example, British library’s web archive uses METS standard for flexibility (Enders, 2010:3).

Herring (2015: 3) conducted a case study on the digital repository of York Digital Library (YODL) at the University of York in the United Kingdom based on selecting MODS standards for their repository in the Music Department. The study revealed that MODS schema extended the process of technical metadata such as physical objects and the transfer process of creating key musicological metadata from the YODL and it also revealed MODS element can be drawn close within, generating records inside records (Herring, 2015: 12:13). Lorio and Schaerf (2015: 3) examined the case of the Sapienza University of Rome for producing a project of Sapienza Digital Library (SDL), for implementing MODS standard to support the use of digital material. The

observations revealed that inside the SDL application, the descriptive metadata is coded in MODS, for illustrating the intellectual content of the Sapienza Digital Library Information Package (SDL-IP). MODS employs libraries semantics that is obtained from the MARC 21 standard format and used by digital libraries (Lorio and Schaerf, 2015: 3). Furthermore, the SDL MODS profile includes the metadata elements that are important for the metadata MODS XML coding and defines the structural and functional contexts, where elements and attributes can be used, and describes the duty controls of the XML elements' reality (Lorio and Schaerf, 2015:6).

Findings from the research conducted at North American academic libraries and the United Kingdom supported and implemented the TEI Guidelines, started with the TEI and XML in Digital Libraries Workshop sponsored by the Digital Library Federation (DLF) in 1998 (Hawkins, Dalmau, & Bauman 2011). Libraries support text encoding across their library task and adopt the practices of finalizing a text-encoding project from consulting and training to definite markup and web dissemination (Dalmau and Hawkins, 2015: 10).

Kolb-Proust Archive at the University of Illinois was transformed from its analog form into digital form because of the process of text encoding with the TEI Guidelines. For instance, Kolb-Proust Archive librarian utilized text encoding with the TEI Guidelines for the written text of the note cards to translate archive's paper database of note cards into a searchable electronic database (Green, 2014: 223). University of Virginia (UVA) library described how supported the service of text encoding in TEI Guidelines: librarians generated e-book texts marked up in TEI formats, users search functions, the standard of English book online developed and website's plan for the TEI schema (Green, 2014: 227).

Encoded Archival Description (EAD) is an XML standard for encoding archival finding aids for a digital environment and is maintained (Library of Congress, 2020).

Francisco-Revilla et al. (2014: 1) conducted a study to analyse a finding aid gathered by the Texas Archival Repository Online (TARO) using VADA, a visual analytic tool for finding aids, to describe the encoding EAD and provides a better quality of finding aid metadata. The results of this study based on providing a better quality of finding aid metadata by VADA revealed two challenges: one associated with the EAD standard which requires limited elements to create quality EAD documents and the

second associated with encoding practices refers to encoding practices inside archival repositories (Francisco-Revilla et al., 2014: 6).

Hakimjavadi and Masrek (2013: 34) conducted a study at the University Technology MARA in Malaysia to assess the status of eight interoperability rules within repositories of electronic theses and dissertations (ETDs) as an overview to more studies on the viability of implementing these rules in future areas of interoperability. Findings pointed out that regardless of its disadvantages, Protocol for Metadata Harvesting (PMH) is still the highly used interoperability protocol within ETD providers, ETD software developers, and implementers, followed by ATOM and Object Reuse and Exchange (ORE) protocols (Hakimjavadi & Masrek, 2013: 54). However, the three protocols of ATOM, PMH, and ORE assessments results revealed that they utilized for exchange mostly in the cases of interoperability rules in repositories. Kalb et al. (2013: 20) conducted a study on policy interoperability of digital libraries and digital repositories for their shared facilities on how the policies, strategies, frameworks, and plans of the digital libraries are affected by interoperability. The results indicated that the present guidelines of the organizations have been reviewed according to those of other organizations about guideline interchange and reprocessing only in the scope of preservation, access, collection development, and metadata (Kalb et al., 2013: 20).

2.12. Summary

This chapter presented the conceptual framework and literature review. The conceptual framework defined metadata, metadata standards, MODS, PREMIS and digital data preservation. The literature review presented studies that have been conducted in the same area. The major issues coming from the literature shows different metadata standards are used by different organizations and the lack of skills in creating metadata. The literature points out that metadata librarian faced difficulties during the metadata creation process because they found numerous unclear metadata concepts, a lack of skills to determine what metadata elements were suitable for metadata librarian and users, a lack of information on the digitized collections, and the lack of necessary qualifications and skills for the staff to perform.

The following chapter will discuss the research methodology used by the study to investigate how metadata is created and managed and the role it plays in the digital preservation of resources in selected libraries in Cape Town.

Chapter Three: Research Methodology

3.1 Introduction

The previous chapter discussed conceptual framework and literature review for the study.

This chapter explains the research methodology and methods selected by the researcher to investigate how metadata is created and managed and the role it plays in the digital preservation of resources in selected libraries in Cape Town.

Creswell (2014: 3) states that research methodology involves strategies, theories, processes of inquiry, data gathering, and analysis. The researcher defines the research methodology as a unit that offers the layout of the methods that were used in a study. This chapter begins by explaining the research design, the research method, data collection, data analysis, and validity and reliability.

3.2 Research design

According to Yin (2017: 25) research design is the plan that links the research to an opening research question and to research conclusions. A research design is a strategy, structure, and approach of inquiry to be formed to answer research questions or problems (Kumar, 2011). In other words, the research design details are a procedural plan of how essential information is collected to answer the research problem and corrected it. The primary purpose of the research design is to answer the research questions of the study (Yin, 2017: 26). The following section will present the qualitative research approach.

3.2.1 Qualitative research approach

A qualitative approach is a form of social science research that organizes and works without numerical data and seeks to understand social life by studying the thoughts of human beings (Punch, 2014: 3). In addition, qualitative research intends to provide information for understanding human behavior, emotion, attitudes, and experiences (Tong et al., 2012: 1). In this study the researcher adopted a qualitative research approach to study the scope of creating and managing metadata in the preservation of digital information in selected libraries in Cape Town. Qualitative data was collected through interviews and document analysis using content analysis to analyze the data.

Qualitative research was suitable for this study because it did not intend to measure or compare quantitative variables.

The population was small, and qualitative data was more suitable to answer the research questions posed in the study.

3.3 Research method

In qualitative research the following research designs are used: case study, ethnography, grounded theory, phenomenology, and narrative studies (Maree, 2016: 75). In this study, the researcher adopted a comparative case study research design.

3.3.1 Comparative case study method

According to Barlett and Vavrus (2017: 6), a comparative case study is defined as a technique that comes from practice and helps in the process of engaging two or more situations to find a solution. The comparative case study can strengthen and explain the unique contributions of qualitative research (Bartlett and Vavrus, 2017: 5). The comparative case study method was appropriate for this study to help the researcher to collect in-depth data on the use of metadata creation and management in the preservation of digital information in selected libraries in Cape Town. This is because a comparative case study ensures an understanding of the similarities and incorporates qualitative research into the study (Barlett and Vavrus, 2017: 907). This was done by comparing similarities of data collection based on selected libraries in Cape Town for this study.

The researcher chose the following two different libraries: Western Cape Provincial Library Services (WCPLS) and the University of Cape Town (UCT) Libraries. This is because the two are different in that one is an academic library and the other is a public library. Therefore, despite the differences between the two libraries were chosen because they are engaged in similar metadata practices. The two libraries were chosen because they have established units for metadata creation and management, as well as metadata creation tools.

3.4 Population and sampling

A target population refers to the whole unit of objects or people that are included in the research and about which the researcher wants to investigate (Bless, Higson-Smith & Sithole, and 2013: 162). The population of the study was academic and public

metadata librarians in the two universities mentioned above. The WCPLS cataloguing unit was a small unit, with four staff members. The UCT Discovery Services was also a small unit consisting of three staff members.

To obtain information on a phenomenon of interest, sampling is the process of choosing a subset of the population from the researcher's target population of interest to represent the entire population (De Vos et al. 2011: 390; Polit and Beck, 2012: 742). The goal of sampling is to study all the elements that may form the population of interest to increase the effectiveness of a research study (Lobiondo and Haber 2010: 224). When using sampling methods, there are two types namely: probability and non-probability sampling (Leedy and Ormrod, 2015: 176-190). Probability sampling is the process of selecting a portion of the population of the study (Mukherji and Albon, 2015:237). Probability consists of simple random, systematic, stratified, and cluster sampling (Pickard, 2013). Non-probability sampling is the process where the chance of being selected for a study is not known and is subjective to the researcher based on principles that allow the researcher to collect rich and important data (Kumar, 2011). Non-probability sampling consists of quota, snowball, sequential, and purposive sampling (Pickard, 2013). For this study, the researcher employed non-probability sampling, in a form of purposive sampling technique. This is because purposive sampling is employed in qualitative research and participants and sites that can purposefully inform an understanding of the research problem of the selected study (Creswell, 2012: 208). The researcher purposefully targeted metadata librarians because they are responsible for metadata creation and management. The sampling frame is presented in table 3.1.

Table 3.1: Sampling frame

Organization	**Population**	**Sample**
Western Cape Provincial Library Service – Cataloguing Unit	Metadata Librarians	**3**
University of Cape Town Libraries – Discovery Service	Metadata Librarians	**4**
Total sample size	**Librarians**	**7**

The researcher collected data from all the metadata librarians that are represented in the table. All librarians from this table were selected because they are the metadata creation and management in their libraries. However, only seven interviews were conducted and analyzed due to the unavailability of the other three metadata librarians. According to De Vos et al. (2011: 391), in qualitative research, the sample size does not require strict guidelines.

3.6 Data collection procedures

Data collection is the process of collecting information in research studies and enables researchers to ascertain the best systematic to answer stated research questions, test hypotheses, and evaluate outcomes (Kabir, 2016: 202). Data collection consists of using different techniques or tools such as questionnaires, focus group discussions, observations, interviews, and document analysis (Barbie, 2010).

In this study, the qualitative data was collected through semi-structured interviews and document analyses. Before the interviews started, the researcher requested permission from the organizations to collect data (see Appendix D). The researcher started the process by conducting and securing appointments with metadata librarians. Metadata librarians from selected libraries confirmed the day and time they were available for interviews. Then the researcher gave the participants the informed consent form to read and sign it (see Appendix B). Before the interviews started, the researcher requested permission to have the research interview recorded, the researcher used Huawei smartphone recorder.

Three metadata librarians of the WCPLS were interviewed face-to-face. The same types of interview questions were also employed to UCT Libraries.

The researcher also took some notes during the process of interviews as a backup. The metadata librarians were interviewed in their offices for between 30 and 45 minutes.

Thereafter, the researcher requested library documents to review from the interviewed libraries. The researcher consulted written library documents such as metadata creation and management policy. These policies were included in cataloguing manuals, and metadata standards were adopted by selected libraries. A document

analysis checklist was developed to ascertain whether library policies can answer the research questions of the study. The data collection process started on 13 June 2022 and concluded on 26 July 2022.

3.7 Data collection instruments

Brinkmann and Kvale (2015: 212), noted that careful data collection is important to keep the truthfulness of the research. Data collection involves different instruments such as tools such as questionnaires, focus group discussions, observations, interviews, and document analysis (Barbie, 2010). In this study, the researcher employed semi-structured interviews (face-to-face) and document analysis.

3.7.1 Interview schedule

Vosloo (2014: 331) defines an interview schedule as a data collection tool that is intended for data exchange between the researcher and the interviewee.

According to Saunders et al. (2012) there are three types of interviews: structured, semi-structured and unstructured interviews. The structured interviews refer to a quantitative research technique often used in survey research (Creswell, 2014: 172-173). Semi-structured interviews are organized lists of themes broken down into questions that guide the researcher to ask the participant (Saunders et al., 2012). Unstructured interviews allow the researcher to ask any questions as long it covered all themes of the study (Kumar, 2011: 145). The researcher employed semi-structured interviews to collect qualitative data from seven metadata librarians. This method was supported by because of flexibility on academic library roles in research data management in Norwegian libraries (Boateng, 2015: 32). This schedule assisted the researcher to analyse data based on the questions asked.

The interview schedule was designed around creating and managing metadata in the preservation of digital information. The instrument had twenty-three open-ended questions (see Appendix A).

3.7.2 Document analysis

Document analysis or document review is another method of qualitative data collection that supports the growth of the reliability and validity of the data collected (De Vos, 2015: 127). According to Corbin and Strauss (2015: 214) document review is a systematic method of collecting data by reviewing existing documents. Document

analysis consists of paper presentations, textbooks, company reports, published or unpublished documents, newspapers, journals, letters, websites, and other internet resources (Bell, 2010). Document analysis refers to a challenging data collection tool if the researcher is unable to examine earlier contents of documents (Adosi, 2020: 4). Sarantakos (2013) identifies the advantages of document analysis as follows: documentary analysis is resourceful and easy to access; documents are free from limitations; document analysis can be applied in many forms of research. Sarantakos (2013) also mentions disadvantages such as: document may lack of good indication; document analysis is personal bias; some documents are not updated. For this study, the researcher consulted written library policies and manuals only relating to metadata creation.

A document analysis checklist was developed to gather data to provide context and to triangulate with the response from participants (see Appendix C). Specifically, the checklist ascertained whether metadata policies contain procedures for metadata creation and the standards to be adopted in the creation and management of metadata. Documents that were collected for analysis for this study consist of: Library Cataloguing manual, RDA guidelines, Library Cataloguing guidelines, and OCLC guidelines.

3.8 Validity and Reliability

Validity and reliability are important components in the assessment of measurement tools when collecting data (Tavakol and Dennick 2011: 53). Validity determines the correctness and accuracy of the research techniques used to discover answers (Kumar, 2010: 177). To ensure validity, study must show what really exists and a valid instrument must measure what is intended to measure. It is important to understand that validity involves the entire experimental concept and establishes whether the research findings are accurately measured (Mohajan, 2018: 14). In this study the researcher used qualitative data collection instruments: semi-structured interview and document analysis to collect data from participants. The interview instrument was designed with similar themes to triangulate the data collected. According to Mohajan (2018: 2) state that validity and reliability are measured to increase transparency and decrease opportunities for researcher bias in a qualitative study. Reliability happens when an instrument test gives the same results consistently (Van Zyl, 2014: 115). For

example, a test is measured dependably when it produces the same outcome every time whether it happens in different settings (Creswell, 2014: 199).

For this study, validity and reliability were achieved by pre-testing the instrument with librarians that were not involved in the study. Therefore, librarians found the interview schedule and document review easy to understand and experienced no difficulty to respond to questions.

3.9 Data analysis

Data analysis is the method of arranging structure that makes sense to the collected data (De Vos, et al., 2011: 397). In this study, the researcher adopted the qualitative data analysis method in the form of thematic content analysis. For this study, thematic content analysis was employed to select the main themes from the interview and document analysis as guided by the research questions of the study. Thematic analysis is referred to as a technique for categorizing patterns or themes within qualitative data (Maguire and Delahunt, 2017: 33352). According to Pickard (2017: 320), thematic content analysis is a coding method for converting raw data into a standardized presentation for data analysis purposes. The data responses were coded manually to create themes because the collected data volume was not large. The recorded qualitative interviews were transcribed to convert the recorded interview into texts by Microsoft Word 365. The researcher cleaned the data and arranged it into themes for proper analysis. Data were presented by discussing themes and groups in the form of this study.

3.10 Ethical considerations

Ethics are very vital in research, especially social science research where humans are mostly the subjects of the research (Lynn and Powell 2010: 68). Ethical behaviour helps the honesty of research, controls dishonesty, and manages new challenging issues (Creswell, 2013: 132). The ethical considerations were contemplated in this study. Ethical clearance was first obtained by the University of Cape Town Ethics Committee and then the two study sites (see Appendix E and F). Permission was obtained from the WCPLS and UCT Libraries.

Before data was collected, the researcher explained the purpose of the study to the respondents at both sites. The researcher explained the contents of the consent forms first. Participants were asked to sign the informed consent. The researcher made sure

that the respondents' privacy, anonymity, and confidentiality are guaranteed throughout the study. The researcher informed the participants that participation was voluntary and that respondents can withdraw at any time.

3.11 Summary

This chapter outlined the research methodology and methods used to this study. The aim of the study was to investigate how metadata is created and managed and the role it plays in the digital preservation of resources in selected libraries in Cape Town. Research design, research method, data collection, data analysis, validity and reliability and ethical considerations were discussed. The following chapter will focus on data analysis and presents the results of the study.

Chapter Four: Analysis and presentation of findings

4.1 Introduction

The previous chapter explained the methodology of this study and provided the structure for data collection. This chapter presents findings from data that was collected from the participants through two data collection tools: semi-structured interviews (face-to-face) and document analysis. The researcher triangulated document analysis with the interview.

The main objective of this study was to investigate how metadata is created and managed and the role it plays in the digital preservation of resources in selected libraries in Cape Town. The analysis of findings in this study was done in line with the research questions of the study.

As indicated in the previous chapter, the population of the study comprised seven metadata librarians. Furthermore, it was subsequently found that the seven semi-structured interviews provided enough information for the study to answer the research problem.

This chapter presents data according to the interview schedule that consisted of twenty-one questions (see Appendix A) derived from the research questions.

The specific research questions are:

- How is metadata created for the preservation of digital information in libraries in Cape Town?
- What strategies are used to manage metadata for the preservation of digital information in selected libraries in Cape Town?
- What best practices must be used in metadata creation and management in selected libraries in Cape Town?
- What are the challenges in the creation and management of metadata for digital preservation in selected libraries in Cape Town?

4.2 Presentation of qualitative data

The researcher presented the data based on the interview research schedule. This section presents data on seven main themes namely:

- Section A: Demographic information,
- Section B: Metadata creation
- Section C: Metadata for digital preservation
- Section D: Metadata standards
- Section E: Metadata management
- Section F: Metadata challenges in digital preservation
- Document analysis

The researcher presents document analysis data that was used to review the name of the document, the date of creation and who is accountable for the document, metadata creation procedure, metadata standards used, metadata tools, and metadata creation and management in selected libraries in Cape Town. The data from library documents was used to corroborate findings from the research interviews.

4.3 Section A: Demographic details of respondents

The selected libraries in Cape Town identities are not mentioned because of ethical reasons. Respondents have been given the pseudonyms of respondent one up to respondent seven. Three respondents were from public libraries and four were from academic libraries. The respondents' profiles are shown in table 4.1.

Table 4.1: Respondents' profile

Respondents	Library	Designation	Experience
Respondent one	Public	Metadata librarian	33 years
Respondent two	Public	Metadata librarian	25 years
Respondent three	Public	Metadata librarian	23 years
Respondent four	Academic	Metadata librarian	15 years
Respondent five	Academic	Metadata librarian	26 years
Respondent six	Academic	Metadata librarian	10 years
Respondent seven	Academic	Metadata librarian	6 years

Table 4.1 presents the findings of the responding metadata librarians. Most of the respondents have more than 20 years of work experience creating metadata in their respective libraries. Therefore, respondents' experience starts from 6-33 years for this study.

4.4 Section B: Metadata creation

Section B addresses questions to understand the process of metadata creation in selected libraries in Cape Town. This section covers the type of metadata libraries create; the reasons for creating metadata, the tools used to create metadata, and the metadata creation process.

4.4.1 Types of metadata library created by libraries

The findings in this section are about the types of metadata that are created in libraries. Comments from respondents are presented below:

> Respondent one: "*We create bibliographic information for books and a bit for periodicals, just at a quite simple level, and we also create bibliographic records for audiovisual material as well such as DVDs and CDs for discovery."*
>
> Respondent two: mentioned that *"We create bibliographic information for books, CDs, DVDs, and magazines to be accessed by our user."*
>
> Respondent three: mentioned that *"I create bibliographic information for print, e-books, and journals to be discovered by our users."*
>
> Respondent four: indicated that *"I create descriptive metadata records for books, e-books, maps, digital objects, theses, audiobooks, and government publications and I use descriptive metadata to be displayed and discovery by our users."*
>
> Respondent five: stated that *"We mostly create descriptive metadata, and then there is some technical metadata in there as well."*
>
> Respondent six: further indicated that *"I create bibliographic descriptive information which includes the cataloguing and classification procedures. I also create metadata elements such as title, ISBN, name of publisher, place of publication and date of publication."*

Respondent seven: indicated that *"We create descriptive metadata which enables discovery identification and selection of resources. Our descriptive metadata includes elements such as title, author, keywords, subject headings and abstracts or the description of the resource, and then administrators, which provides information to help manage the resource."*

From the responses, participants indicated that they mainly create descriptive metadata for printed books, e-books, maps, arts, journals, theses, digital objects, and audio-visual material such as CDs and DVDs for display and discovery by their users.

4.4.2 Tools used to create metadata

This question was asked to determine the tools that are used by different libraries to create metadata. This was done because different tools are used and, in some libraries, literature has indicated that they lack tools for bibliographic description. Adebayo (2013) revealed that the challenges of cataloguing digital resources are the lack of ICT skills, insufficient number of professional cataloguers, and lack of knowledge of digital literacy standards such as the MARC and Dublin Core.

Responses from the interviews are as follows:

Respondent one: pointed out that "*We used Anglo-American Cataloguing Rules (AACR2), Resource Description and Access (RDA), Library of Congress Subject Heading (LCSH), Dewey Decimal Classification System (DDC) and WorldCat as the tools in the creation of metadata."*

Respondent two: mentioned that *"We use international tools such as DDC, AACR, LCSH, RDA, MARC tags and Online Computer Library Center (OCLC).*

Respondent three: stated that *"To be honest mostly we used international tools such as DDC, RDA, AACR2, LCSH, MARC21 tags, and British library in the creation of metadata.*

Respondent four: mentioned that *"We are using MARC 21 tags which are using MARC fields, RDA. RDA is the new standard of cataloguing that replaced AARC2. We also use the subject heading from the Library of Congress Subject Headings to be able to allocate the subject heading for each title that we catalog, and DDC which gives the shelf number of a title, we use the online DDC system and our in-house Schedule system."*

Respondent five: indicated that *“We use OCLC, Alma in-house library system for the creation of metadata. We also use Primo for students to access the information for their studies, RDA rules, and MARC tags. We use Dublin core to create a digital catalog for library materials, use Getty for geographical names, and Library of Congress Subject Headings for creating the approved subject heading.”*

Respondent six: mentioned that *"For us, we normally used Excel spreadsheets and, but now we are using Google Drive so that we can have not only spreadsheets accessible by everyone, but we do not have versioning issues. We also use controlled vocabularies for some of our fields. We mostly use the Library of Congress Subject Headings, but it is not sufficient for our needs. So, we are also creating a local vocabulary of South African terms that we are going to use but the Library of Congress is the main one.”*

Respondent seven: indicated that *“We are using tools for our monographs and serials which is we applied RDA principles, DDC for classification systems, National Library of Medicine for medicine books, Mcclovin for music materials.”*

Based on the responses received, the tools that are used in the creation of metadata are mainly internationally recognized tools such as DDC schedules, RDA toolkit, AACR2 cataloguing rules, MARC21, OCLC system, LCSH books, and online resources. Other tools that were mentioned are Alma and MCclovin. One respondent mentioned that they are also using housel tools such as the Schedule system to cover the local subject.

4.4.3 Metadata creation process

This question of the study aimed to understand the process of metadata creation in selected libraries in Cape Town. A respondent commented that:

Respondent one: pointed that *"We usually import records or download records from the WorldCat into Slims which is our system library information management but before we download the record, we choose the best record and update the holdings (copy cataloguing).*

Respondent two: indicated that *"Before we start to create a record for our books or digital collections, we start by searching our in-house system by using*

metadata elements such as title, author, or ISBN but preferable we use ISBN to avoid the duplication of creating double records. Then after that, if we do not have a record, we search and download from the WorldCat and edit the record according to our library system that will suit our users."

Respondent three: indicated that *"What we normally do we either download the record from WorldCat or create the original record from scratch on Slims which is our in-house library system. And we make sure we adhere to international standards after downloading the record to our system. Then after that, we need to clean the record and make sure all the required standards are sorted."*

Respondent four: mentioned that *"Firstly we create metadata record on OCLC detailed all MARC fields with all notes, subject headings, and shelf number (traditional cataloguing). If we are comfortable with the number that it can be used by other libraries that record can be copied to Alma in-house library system so that students can be able to access or retrieve the record information from Primo system that they use for discovery services."*

Respondent five: indicated that *"We create detailed metadata for our record on OCLC then export to Alma which is our in-house cataloging system. And the students will access whatever we created on Alma through Primo and that is our user interface."*

Respondent six: mentioned that *"We fill out the appropriate Excel form where we create the required metadata field for the digital object for our repository."*

Respondent seven: mentioned that: *"We have a team of metadata librarians that create the metadata and specifically for descriptive metadata. We create metadata on the Alma system for the monographic items and the serials and the metadata side for DSpace for the institutional repositories."*

Based on the responses, participants indicated that first, they checked if the records were available on their in-house library system. If the record is not found, they download the record from the WorldCat into their library system (copy cataloguing). Respondents also mentioned that if there is no record found in OCLC, they create the record from scratch (traditional cataloguing). This means that libraries perform both copy cataloguing and traditional cataloguing to create metadata.

4.5 Section C: Metadata for digital preservation

This section sought to understand the type of metadata that works with digital objects that are stored to ensure access by providing details for metadata for digital preservation in selected libraries of Cape Town.

4.5.1 Type of digital objects described

This question of the study aimed to find out the type of digital objects that are used to assign metadata. Responses are narrated below as follow:

> Respondent one: mentioned that *"Our digital objects are CDs, DVDs, sound recordings, and videos. As a result, recently we started creating metadata for e-books from the OverDrive American system."*
>
> Respondent two: indicated that *"We have CDs, DVDs and in the past, we had video cassettes and vinyl records."*
>
> Respondent three: stated that *"We have CDs, DVDs, and audio cassettes."*
>
> Respondent four: said that *"We have artworks, e-books, CDs, DVDs, audio, e-research data, e-journal articles, and e-dissertations."*
>
> Respondent five: indicated that *"We have DVDs, and we also have old VHS tapes and then we have CDs, microfilm, microfiche, and old cassettes."*
>
> Respondent six: pointed out that *"We have lots of digital objects such as TIFF, JPEG, PDF, MP4, audio files and version files for image and documents."*
>
> Respondent seven: mentioned that: *"For our monographic serial site, we do catalog CDs, DVDs, e-journal articles, e-theses, e-dissertations, e-research data and we have a music section where we create data for scores and various type of music items."*

The finding revealed that libraries have the following digital objects: CDs, DVDs, digital artworks, e-books, e-journal articles, e-theses, e-dissertations, e-research data, audio files, MP4 files (videos), TIFF and, JPEG files (pictures) and PDF documents that reflect the business value of the library.

4.5.2 Preservation metadata elements that are used in selected libraries in Cape Town

This question was asked to determine the most important metadata elements that are used in selected libraries in Cape Town. Below are responses from the interviews:

Respondent one: indicated that *"We just applied the most used metadata elements such as International Standard Book Number (ISBN) is the most important. We also use the title, author, and series."*

Respondent two: stated that *"The most important metadata elements that we always use, titles, authors, subject headings from Library of Congress, DDC numbers and series."*

Respondent three: pointed out that *"We always start with the ISBN as their guide, followed by the title, author, publication information, pagination, subject headings, summary, and shelf number."*

Respondent four: said that *"When we create the record for the object, we use metadata elements such as ISBN, author which is 100, and then you have your 245 which is the title. 300 is a physical description of the item, 440/90 is series, 500 is notes field or summary and then you will have your 650 subject headings that go with shelf number."*

Respondent five: indicated that *"We have for OCLC follow the RDA format and they use MARC for a digital object, and they use the spreadsheet for Dublin core formats. Dublin core consists of 15 metadata elements title, creator, subject, description, publisher, contributor, date, type, format, identifier, language, source, coverage, rights, and relation. And it is a different format from RDA you use a spreadsheet and does not have to follow the straight-out rules."*

Respondent six: pointed out that *"The identifier is a very crucial metadata element at this stage. For instance, if you do not have the right identifier, you are going to lose track of what is what. Then we use metadata elements such as title, date, and creator of the original."*

Respondent seven: indicated that *"Our descriptive metadata elements point of view, we are using the title, author, ISBN, keywords, subject headings that authorized by LCSH authority and then we also use abstracts to describe the*

articles that they create their metadata for and that happens both in the Alma catalog and it also happens on digital repository side as well."

The study results from the participants revealed that the most important preservation metadata elements that are used in their libraries are ISBN, author, title, *publication* information, pagination, subject headings, summary, and shelf number.

4.5.3 Metadata storage and update

This question of the study wanted to understand how metadata is stored and updated in digital preservation systems in their libraries. Responses are below:

Respondent one: mentioned that *"We stored our bibliographic records and update our authority records regularly on Slims library system. If you update the authority record, then it automatically displays correctly in all the attached bibliographic records."*

Respondent two: indicated that *"We create bibliographic records for individual items and uploading on the library system and authority record are also created. The authority records include subject headings and cross-references and ensure the consistency of headings and thus access point."*

Respondent three: stated that *"We upload our finished record on Slims library system and update metadata elements such as subject heading and author's name form, name of a publisher to our authority file. And then this process gives a standardized access point."*

Respondent four: mentioned that *"Our system is a cloud-based system, so our information is stored in the cloud."*

Respondent five: indicated that *"Our metadata is stored in OCLC. We also export whatever they created into Alma, our internal system, and we make changes to the system. All the information on Alma will be available to our users, researchers, or students to access through the Primo database. Primo is where our catalog records for books and visual materials are available but digital collections are on Ibali which is also called a digital library."*

Respondent six: indicated that *"What we normally do is to ingest additional metadata to update it, or we can go into the system and update it there manually."*

Respondent seven: mentioned that *"Our most descriptive metadata is on the Alma side, and we do a lot of more intense description in the Alma catalog. On the digital repository site, we described and stored metadata elements that described our monographies and e-thesis. The Alma system allows us to just elaborate and to describe informal detail, and then what the repository side allows us to do with the DSpace."*

Findings revealed that participants are using different library systems to preserve their metadata. Participants indicated that they create bibliographic records for individual items and upload them into their library systems. Furthermore, another participant indicated that they store their records in a cloud system. The results also revealed that they store and update the metadata on their digital platforms. Based on the responses it is clear that all participants are using different library systems to store and update their metadata. Metadata records are stored internally and externally.

4.6 Section D: Metadata standards

Section D aimed to understand the standards used in the creation and management of metadata in selected libraries of Cape Town.

4.6.1 Metadata standards used in the creation of metadata

This question of the study aimed to understand what metadata standards are employed in the creation and management of metadata in their libraries. Interviews responses follow:

Respondent one: mentioned that *"For us, we use RDA rules partially because we are creating basic metadata for public libraries, and we do not have to go into detail. We applied MARC tags as well when we are creating metadata for our library material and applied AACR2."*

Respondent two: indicated that *"Metadata standards we are using are AACR2, DDC, and Library of Congress Subject Headings on a basic level."*

Respondent three: pointed out that *"We use international metadata standards that have been accepted worldwide. That is Library of Congress subject*

headings and AACR, MARC 21 tags, Dewey Decimal Classification, RDA, and then standards set by the British Library and Library of Congress subject headings and internal standards as well."

Respondent four: indicated that *"We are applying international standards which is the use RDA, we use the Library of Congress Subject Heading and then we use DDC."*

Respondent five: mentioned that *"We are using RDA and MARC which is a machine-readable catalog for OCLC, Library Congress subject heading, geographical names that we access via the OCLC, DDC, Dublin core for metadata, and for digital objects they use Getty for geographical name and arts. And MARC tags are also working well with Dublin core for creating metadata for the digital object."*

Respondent six: indicated that: *"We are using two metadata standards. Our library archive uses Dublin core for the images that they put on the website and ISAD(G), which is the international standard archival description general."*

Respondent seven: said: *"There are two main ones they do focus on RDA principles. A lot of our library collections in our catalog are still in AACR2, and we also use LCSH and different classification systems which are DDC and McColvin for the music cataloguing. We also use the National Library of Medicine Classification for medicine-related books and then for all other books it might be researched related we use the Library of Congress."*

The findings indicated that libraries adopted well-used metadata standards to create their record. Popular standards used by libraries are AACR2, RDA, MARC 21 tags, DDC, LCSH, and Dublin Core. Although other libraries use less popular standards such as Getty, ISAD(G), McColvin, and National Library of Medicine Classification.

4.6.2 Reasons for adopting metadata standards

This question of the study wanted to understand the reasons for choosing specific standards for creating metadata. The respondents said:

Respondent one: mentions that "*It is because our records are interchangeable with other library systems, but also keep it simple for public library users.*

Metadata standards are also allowing us to well describe and be able to control our digital content."

Respondent two: indicated that *"It is international standards. We applied simple level of standards for public libraries because we create records for ordinary users."*

Respondent three: stated that "*We applied standards that have been accepted worldwide and have been the most used in public libraries."*

Respondent four: indicated that "*The standards are working very well for the detailed creation of metadata and displaying the record as well."*

Respondent five: mentioned that "*This is because we adhered to these standards because everybody follows the international standard. It also because of the standards it easy for them to access or to export record into their internal system."*

Respondent six: mentioned that "*It is because standards are working well with our online repository, and it is good for interoperability. For instance, Dublin Core was chosen partly because it is very user-friendly and because it is simple, which means it is interoperable with other systems and it is also comprehensive."*

Respondent seven: stated that *"It is a list of standards that we adhered to for metadata creation in our library for so many years and there is a collaboration of libraries using MARC tags on OCLC. This is because we need to keep consistency when we adhered to these standards for sake of collaboration of cataloguing records and to adhere to international standards as well."*

Findings revealed that respondents indicated that it is because these are international standards that have been accepted. The findings also revealed that libraries adopted the standards to share records and keep consistency for the sake of collaboration of digital records.

4.7 Section E: Metadata management

Section E seeks to understand the strategies for the management of metadata. It also involves the policies and procedures that ensure metadata can be integrated and accessible across the libraries.

4.7.1 Managing metadata strategies

This question of the study wanted to know the strategies that are employed to manage metadata in the selected libraries in Cape Town. Participants' responses are provided below:

> Respondent one: indicated that *"We do a bit of maintenance, and we do on an ongoing basis to clean up the records, and then our shared system between the public libraries we monitor and do a bit of cleanup of the records."*
>
> Respondent two: mentioned that *"We create authority records which ensure good and easy access to individual items. And we consistently do a database cleanup and maintenance by removing incorrect and duplicate headings."*
>
> Respondent three: stated that *"We applied the chief strategy to use a structured format as provided in the bibliographic description and informed by the standards already mentioned in the previous question. We also performed regular authority record cleanups such as author name form, subject heading, and corporate name form."*
>
> Respondent four: mentioned that *"We manage metadata, depending on how we create our different kind of record or probably when we look at for example an authority name for a person it should be standardized for each person. We also comply with the approved subject heading form from the Library of Congress authority subject headings."*
>
> Respondent five: mentioned that *"We hold discussions repeatedly to check our work if it is accurate. We also check our OCLC record to see if the metadata corresponds to the item in hand to access the record."*
>
> Respondent six: indicated that *"We create the metadata once to avoid multiple versions of the metadata on different people's computers. That is why we create metadata in Google Drive so that it is always in there and is up to date. We have a centralized place for all the metadata in Google Drive. We also created*

a template for metadata so that if we are required to create additional metadata, we can see if the metadata has already been done and so on."

Respondent seven: mentioned that "*We adhere to very strict standards, and we try to create a clean metadata record. This means the is no noise and we try to not input the wrong metadata as such. Authority control is one of the most important management functions of metadata creation. We do create a lot of original cataloging records that we upload to OCLC. We also make use of the already validated subject index which makes the quality control so much better.*"

All the participants provided different strategies to manage metadata creation in their libraries. The findings also reveal that the participants understand all the tools used to manage digital resources in their libraries. Findings revealed that authority control is one of the most important management functions of metadata creation to ensure the effective accessibility of records. The findings also revealed that libraries adhere to international standards and tools for managing metadata. Other respondents revealed that they do quality control of their records to maintain high standards of their records by cleaning up the records and validating subject headings. Respondents also indicated that they double-check their OCLC record to see if the metadata is the same as their object. This is because if the metadata is not created correctly the record is not going to be retrieved.

4.8 Section F: Metadata challenges in digital preservation

Section F addresses questions to understand metadata challenges in digital preservation in selected libraries of Cape Town.

4.8.1 Challenges encountered in the preservation of metadata in a digital environment

This section of the study wants to understand the challenges in the preservation of metadata in a digital environment. Interview responses below:

Respondent one: mentioned that "*The one aspect that we aren't happy with in our current system is the lack of security. Librarians sometimes get access to our cataloguing records and create unnecessary metadata and sometimes delete our records. Our system is not user-friendly. If you search for an item, you don't get the exact information you search and also most of the time it does not display the correct cover page of the book."*

Respondent two: mentioned that *"We are experiencing a lack of security in our library system as anyone can access and change information in our database. And we do not have any control over who can access the catalog database."*

Respondent three: mentioned that *"The items that have been previously catalogued on a different system and have been pulled through with basic catalog records and incomplete records and go back to re-catalog and classify the items. Another problem has been in authority control where there have been duplications and incorrect spelling."*

Respondent four: indicated that *"Some of the challenges we find when we are creating metadata for pamphlets and the book as well because sometimes does not have enough information to catalog such when it was published or place or name of the publisher."*

Respondent five: stated that *"Currently we lost a lot of information in our collection due to fire because it was not digitized."*

Respondent six: indicated that *"The challenges we found depend on the system we are using. For instance, we are setting up using the pipe character to separate the field. The pipe character is part of our alphabet, it represents a sound, and so that causes a technical challenge because the system thinks we are putting in two things, but it is just part of the word. And our biggest challenge is getting people to create accurate and comprehensive metadata."*

Respondent seven: mentioned that *"We do have a problem that we are using the digital preservation from the repository side that we make use of open-source software. And metadata schema on that side, which is called DSpace, and there are a lot more problems on that side which is we cannot practice quality authority control. For instance, sometimes the item we are working on and the subject field we are working on there does not have enough subject or dates to cover that topic, in that case, we won't go for a broader authority term to make sure that it is described."*

A few factors that affected selected libraries in Cape Town were highlighted by libraries. The first challenge was the lack of security in their library systems as anyone

can access and change information in their database. The other challenge is when the resource does not have enough information to catalog such as when it was published or the place or name of the publisher. It was further revealed that libraries have the challenge to get trained people to create comprehensive accurate metadata. It was also revealed that the challenge of producing quality authority control from the library repository.

4.8.2 Suggested solutions to challenges in the preservation of metadata

This question of the study sought to assess the measures that can be used to address the challenges faced in metadata preservation. Interview responses below:

> Respondent one: mentioned that *"The level of security must be improved that they must keep a tighter control on who gets access to work in in the catalog. And it also needs to be monitored to those librarians should not have access in the 1st place and that there should be spot checks or monitoring done by the system section just to keep tabs that it is all in order."*
>
> Respondent two: mentioned that *"We should have stricter control over who can access our library system."*
>
> Respondent three: mentioned that *"Firstly, when purchasing a new library system, one needs to try and make sure that metadata librarians are being consulted all the time with changes and updates of the library system so that it conforms metadata creation standards. And stricter control needs to be exercised for the new library system."*
>
> Respondent four: stated that *"Publishers must apply consistent information that is needed for metadata librarians, and the fact that it is them who published the item information such who published, where and the date of publication is overly critical for the process of creating, preserve metadata and digital preservation."*
>
> Respondent five: mentioned that *"To identify what is rear and make sure that we have a digital copy of the material, and we must identify what is being used, like books, posters, and arts so that we preserve it by digitizing it because if it has gone the information is lost."*
>
> Respondent six: stated that "*By explaining the purpose of the metadata in a way that resonates with people to understand the way creating the metadata*

and why it matters and for what it is going to be used, and the description of metadata must be accurate for preservation in digital preservation."

Respondent seven: indicated that *"From the repository side and other systems in place, I think they might address a lot of the problems that they have with DSpace, but the problem is that is expensive. And we had to decide on the main catalog system that we are going to use this wonderful, excellent system, and then on the other side they had to make adaptions because some way money needed to be safe."*

The findings revealed that improving the security of library systems in libraries is an option to address the challenges. The other suggestion is that publishers must supply enough data for metadata librarians to be able to describe resources. Metadata librarians must be consulted when new systems are implemented. However, another finding suggested that the competition of library systems must address problems they come across to preserve metadata in digital preservation. The following section presents library documents that were reviewed.

4.9 Document analysis

After the interview, the researcher requested the respondents to provide metadata creation and management documents. The researcher reviewed documents for public library as library one & academic library as library two which concerning the metadata creation and management of digital objects policy and libraries three and four did not show their documents due to ethical reasons. This section presents findings from the documents that were reviewed. The researcher analyzed libraries' policy documents to understand how metadata is created and managed and the role it plays in the digital preservation of resources in selected libraries in Cape Town.

This section will cover the name of the document, the date it was created and what policy entails in terms of metadata creation and management of digital objects. Due to ethical reasons, the researcher will not identify the name of the libraries that submitted the documents.

The four sources of the policy documents are Cataloguing manual, RDA cataloguing standards, Cataloguing guidelines, and OCLC guidelines of the respondents.

4.9.1 Findings of document reviews

The data is presented according to the document analysis tool that consisted of five questions (see full details of Document Analysis Tool Appendix C) derived from research questions.

4.9.1.1 Effective date and who is accountable for the policy

This question of the study sought to understand when the policy document was created and the person responsible for its creation. Table 4.2 below illustrates the responses from document reviews used for this study.

Table 4.2: Documents details

Name of library	Name of document	Date created	Person responsible for metadata creation policy
Library One	Document one - Cataloguing manual Document two - RDA guidelines	2016 2017	Metadata librarians
Library Two	Document 3 - Cataloguing guidelines Document 4 - OCLC guidelines	2017 2016	Metadata librarians

The content from document review indicated that Cataloguing Manual was created in 2016 up to date and RDA guidelines in 2017 by metadata librarians. Other information indicated that Cataloguing Guidelines document was created in 2017 and OCLC Guidelines in 2016 by metadata librarians.

Findings revealed that both libraries' metadata librarians are responsible for the metadata creation policy, and guidelines and effective date for implementing these guidelines were 2016 up to 2017.

4.9.1.2 Metadata creation procedure

This question of the study sought to understand the process of metadata creation.

> **Document 1:** Library one showed that the first step in the process is to check if the resource in hand is not available on the library system by using ISBN search and if no record is found, do another search using the title to avoid duplication of the record. If the record exists, copy cataloguing is performed, and if not then traditional cataloguing is done.
>
> **Document 2:** Library one showed a partial guide to RDA cataloguing. They introduce RDA cataloguing rules in some fields of the bibliographic record (e.g. edition, pagination/illustration, publisher, etc.).
>
> **Document 3:** Library two stipulated that before one create metadata for a resource, first search for resource in your in-house library system to avoid a duplicate record. If there is an earlier edition of the book with a good record, one can derive a record for the book in hand. For instance, if one have the paperback version of a hardback book with an earlier year of publication, one can also create a record for the paperback edition.
>
> **Document 4:** Library two indicated that firstly search the record on OCLC by using ISBN and if found then edit the record according to their standards; then add their libraries holdings and download to their in-house library system. If no record on OCLC for the resource one is cataloguing, create a record on OCLC and double-check if all the standards are confirmed, and save it. Thereafter, export it into their in-house library system.

The result is that both libraries indicated that it is very important to do an ISBN search of resources before one create the record to avoid duplication and they do both copy and traditional cataloguing. Library one's Cataloguing manual and RDA guidelines are not definitive and comprehensive cataloguing documents. This means rules and tools for cataloguing are not fully implemented. Other findings indicated that first metadata librarian creates the record on OCLC and then imports it to their in-house library system. This process is referred to as copy cataloguing.

4.9.1.3 Metadata standards used

This question of the study sought to understand what metadata standards are used by the library when creating metadata.

> **Document 1:** Library one showed framework standards employed are MARC 21 tags, RDA, LCSH, and AARC2. However, the document review also indicated that RDA standards are not fully implemented. This is because they are creating a simple record for their ordinary users for instance edition statement on RDA is written fully but the library one's document still abbreviates the edition statement.
>
> **Document 2:** Library one indicated that they employed bibliographic description as the cataloguing guidance on the rules and practices for books and other resources. The bibliographic description consists of elements that described the resource. The bibliographic description elements are defined as author, title, statement of responsibility, edition, resource type, publication, page description, series, notes, subject, and resource identifier.
>
> **Document 3:** The library two documents review stipulated that they employed the common standards such as Dublin Core, MARC format, LCSH, RDA, ISAD-G, OCLC, and Medical Subject Headings (MESH).
>
> **Document 4:** Library two is no longer using AACR2 and is using RDA guidelines to create metadata for the library resources. For instance, the document review that you can use is a record on OCLC even if the metadata creation is AARC2, but inputs are done according to RDA guidelines.

In summary, both libraries document the metadata standards defined within recognized international standards. Other documents indicated that they follow international bibliographic standards for their resources to create metadata. However, other libraries do not employ RDA guidelines fully because they create a basic record but another one implemented fully RDA guidelines to create metadata for library resources.

4.9.1.4 Metadata creation tools

This question of the study sought to understand what metadata creation tools are employed in the library. The results are shown in Table 4.3.

Table 4.3: Metadata creation tools recorded in selected libraries

Document	Metadata creation tools
Document 1	• AACR2 • DDC • MARC 21 • LCSH • SLIMS • WorldCat
Document 2	• DDC • Dublin core • LCSH • Alma • MARC format • Getty • Ibali • OCLC

As indicated in library documents, libraries recorded different metadata creation tools when cataloguing their resources.

> **Document 1:** Library one stipulated that the library used the following metadata creation tools: DDC, AARC2, MARC 21, WorldCat, LCSH, and SLIMS.
>
> **Document 2:** Library two specified that the library uses the following tools for its metadata creation: DDC, MARC tags, OCLC, LCSH, Alma, Getty, Ibali, and Dublin core. The document also indicated that the in-house library system occasionally creates metadata for periodicals not suitable for inputting on OCLC.
>
> For documents 3 & 4, the researcher did not find any creation tools for cataloguing for both libraries.

The evidence from the documents shows that both libraries have internationally recognized tools.

4.9.1.5 Metadata creation and management training

This question of the study sought to understand whether metadata creation and management training is provided in the policy of the libraries.

> **Document 1:** Library one provides training to newly appointed staff members who are doing cataloguing in-house.
>
> **Document 2:** Library two documents confirmed that training is provided to new metadata librarians and new development programs that have to do with cataloguing procedures through in-house workshops and seminars.
>
> **Documents 3:** Documents confirmed that the cataloguing training is provided by the metadata librarian in-house.
>
> **Document 4:** Library two documents confirmed that OCLC training is provided in-house.

Findings indicated that both libraries provide training to new metadata librarians and new development programmes that have to do with cataloguing procedures through in-house workshops and seminars.

4.10 Summary

In this chapter, collected data was analyzed and presented. The population of the study consisted of seven metadata librarians of selected libraries in Cape Town. The researcher used findings to provide comparisons by supporting the document reviews of the study. The chapter presented data that came from semi-structured interviews and document analysis. The data collected showed how metadata is created and managed and the role it plays in the digital preservation of resources in selected libraries in Cape Town. The findings show that libraries create descriptive metadata for library resources. Findings of the semi-structured interviews and document analysis showed that in both libraries it is very important to do an ISBN search of resources before you create the record to avoid duplication and they do both copy and traditional cataloguing.

The study established that in both libraries their metadata librarians are guided mainly by cataloguing rules when they create metadata for the record. From the findings of the semi-structured interview and document analyses showed that metadata librarians adopted international metadata standards and tools to create their records.

Training is also provided to new metadata librarians and new development programs that concentrate on cataloguing procedures through in-house workshops. The next chapter will discuss the main findings, conclusions, and recommendations.

Chapter Five: Discussion of findings

5.1 Introduction

The previous chapter presented findings and analysis of data collected using interviews and document analysis. Findings are discussed in this chapter as presented in chapter four. This chapter discusses the main findings and incorporates literature reviewed that informed the study.

The main objective of this study was to investigate how metadata is created and managed and the role it plays in digital preservation of resources in selected libraries in Cape Town.

5.2 Descriptive metadata creation

The findings in this section are about the type of metadata that is created in libraries. The findings of the study indicated that selected libraries in Cape Town create descriptive metadata. The descriptive metadata is for printed books, e-books, maps, art, journals, theses and dissertations, digital objects, audio visual material such as CDs and DVDs for display and discovery by their users. Metadata is also created to manage digital resources, provide digital discovery, and archive and preserve resources. Descriptive metadata also helps users to discover the information they are looking for. Liebetrau (2010:30) confirmed that metadata is mainly designed for the discovery, access, identification, management, and preservation of digital objects online. According to Ramesh, Vivekavardhan and Bharath (2015:195-196), descriptive metadata contain information such as title of a book, author, publication dates, description, summary, and locations. These results are similar to the research conducted by Kumar (2018), Welsh and Batley (2012) who pointed out that the descriptive metadata is based on international standards like MARC format to represent library resources in machine readable form. Cabonero and Dolendo (2013), found that descriptive cataloguing skills are fundamental in cataloguing process for LIS professionals for identification, recording metadata about the item and accessibility of an item. Bothmann (2011) states that descriptive metadata is for identification of resource and that it deals with the control of access of points, subject analysis of resources and assignment of classification. Riley (2017) also stressed that descriptive metadata is mainly created to help users with finding resources that they are looking for. Han and Hswe (2011) also stressed that descriptive metadata is meant to assist

with finding and access of digital resources. Therefore, the study and the literature cited stressed that without descriptive metadata we would be unable to access the records. The findings and literature stress the importance of descriptive metadata in metadata creation for digital resources in libraries.

5.3 The tools that are used to create metadata

Based on the responses received from the interviewees, the tools that are used in the creation of metadata are mainly international tools such as DDC, RDA, AACR2, MARC21, and LCSH. The literature reviewed confirms that the different schemas such as METS, MODS and PREMIS are used by the library to support their guidelines for the creation of metadata and its management (Segawe, 2015: 40). Sung (2013) also points out that the basic cataloguing tools are AACR2, RDA toolkit, MARC 21, DDC, Web Dewey, LCC, LCSH, Sears lists subject headings OCLC, and Library of Congress. John-Okeke (2017:129) is of the opinion that cataloguing tools are important in the cataloguing process. These tools aid metadata librarian to create a library record, how to select and record information about the sources in hand (Cullingford, 2011). For instance, El-Sherbini (2013) opines that AACR2 continue to be the main cataloguing tool although it gives challenges when applying it to e-resources. John-Okeke (2018: 129) is of the opinion that RDA was introduced but has not been broadly utilised. The literature largely confirms the findings of the study. Therefore, tools that were found to be used in Cape Town libraries are the same as in other parts of the world.

5.4 The main methods of metadata creation

The study found that libraries perform both original and copy cataloguing. Findings were also revealed during the metadata creation process, if the record is not found, metadata librarians download the record from the WorldCat into their library system (copy cataloguing). Similar findings were found in the study by Banjade (2016: 34) who found that metadata librarians in Nepal universities' libraries also perform copy and original cataloguing. Purongo (2014) found that cataloguers performed copy cataloguing in their libraries. According to Monyela (2019: 25) the copy cataloguing is done by qualified metadata librarians and original cataloguing is done by professional metadata librarians (Bothmann, 2011). This is because they could easily identify poor records and edit them to conform to cataloguing standards.

Based on the findings and literature, it has been established that copy cataloguing records save the time for metadata librarians and only qualified metadata librarians must do it.

5.5 Digital objects being catalogued in libraries

Findings revealed that libraries have the following digital objects: CDs, DVDs, digital art works, e-books, e-journal articles, e-theses, e-dissertations, e-research data, audio files, MP4 files (videos), TIFF and, JPEG files (picture) and PDF that reflect the business value of the library. Riemer (2010:557) found that the efforts to deal with digital objects for metadata creation required more knowledge and skills to display metadata. Ramsamy (2020) indicates that the digital objects constitute digital libraries that are determined by their metadata. Eugui (2012) found that the National Library of Norway (Nasjonalbibliotek, NB) describe digital object creation by digitization of their collections to be accessible online and to preserve the originals. According to Galeffi and Weston (2020) digital objects are catalogued the same as print publications. Although a study conducted by Bayih (2010) indicated that the contents of digital objects cannot be retrieved the same way as print books directly by users. This is because digital objects are vulnerable and required a specific environment to store and accessible (Masenya, 2018). Corrado and Moulaison (2014) stressed that content is the key for digital objects to preserve. Calhoun (2014) defines digital object as the content of digital library. Hui (2012) also defines digital object as electronic media formats, images, sounds and text. However, digital objects stay unseen if there is no metadata that attached to it (Hui, 2012). Digital objects consist of unique identify an object such as an electronic document (Kunjam, 2020). This is because the digital object identify (DOI) is so effective for organization of content on digital network to identify and access (Paskin, 2013). DOI is a more reliable and good method to organize electronic resources (Dhanavandan and Tamizhchelvan, 2012). The digital object is not working without computing environment such as software (Dappert and Enders, 2010). The study conducted by Groenewald and Breytenback (2011) revealed that digital objects should be described with description metadata and preserved. The findings and literature established that digital objects should have a unique identity to manage the content on the digital resources.

5.6 Important metadata elements for digital objects

Findings of the study revealed that the most important preservation metadata elements that are used in libraries are ISBN, author, title, publication information, pagination, subject headings, summary, and shelf number (call number). Dublin Core metadata elements are also important for digital resource discovery (Roy, Sarkar and Ghose, 2010). Eugui (2012) found that National Library of Norway (Norsk Nasjonalbibliotek) used Dublin Core because of its flexibility, easy use and interoperability and supports information sharing. Baker (2012) indicated that Dublin Core supports the preservation of metadata and allows libraries to exchange structure of metadata of the record. Learning Object Material (LOM) are also another important metadata element that has been widely employed by repositories and other learning resource providers (Barker and Campbell, 2010).

Nanigrum (2011) found that the Forestry Research and Development Agency (FORDA) digital libraries cover all important metadata elements to support the interoperability activity. Nevile (2011) also stressed that metadata elements play the role of descriptive metadata, resource discovery, identification and access to digital resources in digital libraries. The findings and literature established that metadata elements are playing a significant role in the discovery of information in the digital libraries. The literature established that metadata elements are important for describing what record data entail of the library record.

5.7 Metadata standards used in libraries

The findings of the study indicated that popular standards used by libraries are AACR2, RDA, MARC 21, DDC, LCSH, and Dublin Core. It also indicated that other libraries use less popular standards such as Getty, ISAD-G, McColvin and National Library of Medicine Classification. Document analysis findings confirmed that they used the common standards such as Dublin Core, MARC format, LCSH, RDA, ISAD-G, and Medical Subject Headings (MESH). A similar study was done by Chandrappa and Harinarayana (2018:87) and found that the metadata standards are guidelines for the creation of metadata of library records and assessment of those records. These standards play a vital role in the creation of metadata structure in the practice of digital preservation and help the method of discovering resources by the users (Segawa, 2015:48). The difference with MARC standard is that it provide detailed description of the cataloguing record and access (Klungthanaboon, 2010). MARC was found to be

widely used in libraries (Wahid, Warraich and Tahira, 2018). Park and Tosaka (2010:104) found that MARC, AACR2, and LCSH are popular used metadata standards in digital libraries. Dublin Core is another commonly used metadata standard in digital libraries (Park and Tosaka, 2010: 104). Hswe and Han (2011: 133) also found that LCSH is frequently used standard for controlled vocabulary and name authority file. AARC2 is replaced by RDA this is because AACR2 was made for card catalog and RDA is for the current digital environment in digital libraries (Tillet, 2013). The findings of the present study and literature established that popularly international standards are used in the creation of metadata in Cape Town libraries.

5.8 The reasons for the adoption of the selected metadata standards

Findings revealed that the chosen standards were selected because these are international standards which have been adopted across the globe. The findings also revealed that libraries adopted the standards to share records and keep consistency for the sake of collaboration of digital records worldwide. It is also because the standards are easy to adopt and use. For instance, Dublin Core was chosen partly because it is very user friendly and because it is simple, which means it is interoperable with other systems and it is also comprehensive. Nanigrum (2011) stressed that metadata standards are required for consistency and interoperability among the resource collections. For instance, Dublin Core provides simple metadata elements for metadata librarians to create a record (Nanigrum, 2011). MARC works best with the use of AACR2 as the most important content standard for selecting descriptive metadata elements (Park and Tosaka, 2010:114). Cataloguing metadata standards serve as a roadmap for the creation of records and as well as guideline for assessing such records (Chandrappa and Harinarayana, 2018). RDA is designed for the digital environment in digital libraries (Tillet, 2011). In a study that was conducted by Walsh (2011), revealed that the LCSH is the most popular standard of controlled vocabulary for subject access in digital libraries. The findings of the present study and literature established that metadata librarians should understand the choice of metadata standards for metadata creation in digital libraries.

5.9 Metadata storage

Findings indicated that libraries create bibliographic records for individual items and upload into their library systems. It also indicated that they store their records in cloud systems or internal storage. Titilola and Ajisafe's (2014) study revealed that the University of Ilorin library classifies, catalogues and store digital content in Koha which is their internal library system. Therefore, Koha adopted MARC standards to store records (Jayakanth, Byrappa and Singh, 2022). Pyrounakis and Nikolaidou (2011) also stressed that DSpace is the most relevant storage open-source software for digital library system to store metadata for research papers, dissertations, thesis, articles, internship reports and other academic digital library materials. However, DSpace adopted the Dublin Core metadata standard (Ahammad, 2019). Tramboo, Shafi and Gul (2011) study revealed that DSpace is the most popular used digital library software and Eprints is also widely used all over the world for educational institution. The study conducted by Patel (2015) revealed that cloud computing is regarded as one of the important technologies for the digital library big data storage process. The findings of the study and literature emphasise that the libraries should adopt the most popular used storage open-source software to store metadata for digital resources in digital libraries.

5.10 Metadata management

Findings revealed that authority control is one of the most important management functions of metadata to ensure the effective accessibility of records. The findings also revealed that libraries adhere to international standards and tools for managing metadata. It also indicated that metadata librarians do quality control of their records to maintain high standards of their records by cleaning up the records and validating subject headings. The findings also indicated that they double-check their OCLC record to see if the metadata is the same as their record. Bello and Mansor (2011) strongly consider that the metadata librarians should be skilled enough to manage bibliographic description of all kinds of resources with the use of appropriate bibliographic tools. Park and Tosaka (2010) have said that the methods to manage metadata quality in digital projects depended on the training of manual value analysis, metadata creation guidelines, and metadata creation tools. Diao and Hernandez (2014) also stressed that the authority control is one of the significant methods of bibliographic control by authorizing a single and unique form heading to manage

metadata. The study done by Bayih (2010) indicated that the National Library of Estonia managed bibliographic records by metadata description standards such as MARC 21, AACR2, LCSH and Dublin Core for digital resource. In a study conducted by Mavume (2013), found that Walter Sisulu University (WSU) libraries have a standardisation of the controlled vocabulary to produce a uniform, consistent and effective management of the bibliographic information for their digital records. Metadata librarians, creators of bibliographic data are responsible for their accuracy and effectiveness to manage the metadata (Maphopha: 2011). The findings and literature emphasized that to manage metadata, metadata librarians should use metadata standards and tools to effectively manage the bibliographic descriptions of all types of resources.

5.11 Challenges of metadata creation and management

Findings revealed that the lack of security in libraries systems is a challenge in the management and creation of metadata. The other challenge is the resources that do not have enough information to catalog. For example, if a resource does not have a publication place and publisher. It was further revealed that the libraries have a challenge to get trained people to create comprehensive accurate metadata. It was also revealed that there are challenges faced with producing quality authority control from the library repository. A similar study by Sambo, Omeluzor and Usman (2014: 11) found that many libraries do not have a digital preservation policy while librarians lack expertise in digital preservation. According to Matlala (2019: 106) the University of KwaZulu-Natal archives have been overwhelmed by digital preservation challenges such as lack of funding, lack of technology skills, lack of trained staff and software obsolescence. Masenya and Ngulube (2019: 18) found that the lack of skills to preserve digital records, lack of funding, poor technology, software obsolescence, copyright issue and lack of management support are the biggest challenges in the creation and management of metadata in academic libraries in South Africa. Sambo, Omeluzor and Usman (2014: 11) found that many libraries do not have digital preservation policy and librarians lack the expertise in digital preservation in Nigeria. According to Cerbo (2011) in Nwosu (2014) new cataloguing environment has changed more into digital environment. Therefore, it is difficult to adapt data created according to old principles with innovations in information technology. The study conducted by Adebayo (2013) investigated the challenges of cataloguing electronic

resources in selected academic libraries in Southwest Nigeria. Findings revealed that cataloguers lack physical description skills, lack of ICT skills, lack of cataloguing electronic resources, insufficient number of professional cataloguers, and lack of knowledge of cataloguing standards (Adebayo, 2013). The findings and literature established that metadata librarians need computer skills, metadata standards, metadata, and management skills, and are willing to learn the ongoing changes in ICT.

5.12 Summary

The chapter discussed and explained how metadata is created and managed and the role it plays in digital preservation of resources in selected libraries in Cape Town.

The findings from this study and literature shows consistency that the selected libraries in Cape Town create descriptive metadata for printed books, e-books, maps, arts, journals, theses, digital objects, audio visual material such as CDs and DVDs for display and discovery by their users. The literature also confirms that the most important preservation metadata elements that are used in their libraries are ISBN, author, title, publication information, pagination, subject headings, summary, and shelf number. The discussion established that the most popular metadata creation standards used by libraries are AACR2, RDA, MARC 21, DDC, LCSH, and Dublin Core. This was confirmed by the literature in the discussions. The discussions also confirmed that the reasons for the use of internationally recognized metadata standards, is because libraries adopted the standards to share records, keep consistency for the sake of collaboration of digital records. The discussions confirmed that metadata librarians performed original and copy cataloguing. In addition, literature confirmed that authority control is one of the most important management functions of metadata creation to ensure effective accessibility of records. The selected libraries in Cape Town adhere to international standards and tools for managing the metadata. Lack of security in library systems, resources not having enough information, and ICT that affect the metadata creation tasks are also highlighted in the literature. The next chapter provides summary, conclusion and recommendations.

Chapter Six: Summary, conclusion, and recommendations

6.1 Introduction

This chapter presents the summary, conclusions and recommendations based on Chapter five. This chapter also suggests areas for further research. The main objective of this study was to investigate how metadata is created and managed and the role it plays in the digital preservation of resources in selected libraries in Cape Town. Qualitative data was collected from the participants through two data collection tools: semi-structured interviews (face-to-face) and document analysis. The researcher triangulated document analysis with the interview.

The data responses were coded manually to create themes because the collected data volume was not large. The recorded qualitative interviews were transcribed to convert the recorded interview into texts by Microsoft Word 365. This was done by comparing current metadata creation and management and the role it plays in the digital preservation of resources in selected libraries in Cape Town.

6.2 Summary

This section provides a summary of the findings. The summary of the findings is presented based on the objectives of the study.

6.2.1 To determine how the metadata can be created for the digital environment in selected libraries in Cape Town

The first study objective investigated how metadata is created for the digital environment in Cape Town libraries. The findings revealed that libraries in Cape Town create descriptive metadata. The descriptive metadata is for printed books, e-books, maps, art, journals, theses and dissertations, digital objects, audio visual material such as CDs and DVDs for display and discovery by their users. Metadata is also created to manage digital resources, provide digital discovery, and archive and preserve resources. Descriptive metadata also helps users to discover the information they are looking for. Therefore, the study and the literature cited stressed that without descriptive metadata we would be unable to access the records. The findings and literature stress the importance of descriptive metadata in metadata creation for digital resources in libraries.

Findings were revealed that during the metadata creation process, if the record is not found, metadata librarians download the record from the WorldCat into their library

system (copy cataloguing). The study revealed that libraries have the following digital objects: CDs, DVDs, digital art works, e-books, e-journal articles, e-theses, e-dissertations, e-research data, audio files, MP4 files (videos), TIFF and, JPEG files (picture) and PDF, reflect the business value of the library. The findings of the study revealed that the most important preservation metadata elements that are used in libraries are ISBN, author, title, publication information, pagination, subject headings, summary, and shelf number (call number). The above objective was achieved; the study found that metadata librarians create descriptive metadata for digital objects and used the most important preservation metadata elements that are used in libraries.

6.2.2 To determine how metadata is managed in the digital environment in selected libraries in Cape Town

Libraries are engaged in metadata management in digital environment. The findings revealed that authority control is one of the most important management functions of metadata to ensure the effective accessibility of records. This study found that the respondents adhered to international standards and tools for managing metadata in libraries. Based on the respondents perceptions of metadata management in digital environment, results showed that metadata librarians do quality control of their records to maintain high standards of their records by cleaning up the records and validating subject headings. The metadata librarians in this study showed that they double-check their OCLC record to see if the metadata is the same as their record. The study findings also revealed that libraries create bibliographic records for individual items and upload into their library systems. The study also found that metadata librarians store their records in cloud systems or internal storage to manage metadata. The findings also revealed that metadata librarians should use metadata standards and tools to effectively manage the bibliographic descriptions of all types of resources. The above study objective was achieved; the study revealed that metadata standards and tools are effective to manage the bibliographic descriptions of all types of resources.

6.2.3 To determine the principles and standards for managing metadata in selected libraries in Cape Town

The study asked metadata librarians to determine the principles and standards for managing metadata in selected Cape Town libraries. The study found that that popular international standards are used for managing metadata in selected libraries in Cape Town. The findings also revealed that libraries adopted the standards to share records

and keep consistency for the sake of collaboration of digital records worldwide. The findings also revealed that selected libraries in Cape Town used mainly internationally tools such as DDC, RDA, AACR2, MARC21, and LCSH for managing metadata. Tools that were found to be used in Cape Town libraries are the same as in other parts of the world. The above objective was achieved; the study indicated that libraries adopted popular international standards for managing metadata and to share records and keep consistency for the sake of collaboration of digital records worldwide.

6.2.4. What are the challenges in the creation and management of metadata for digital preservation in selected libraries in Cape Town?

Findings revealed that the lack of security in libraries systems is a challenge in the management and creation of metadata. The other challenge is the resources that do not have enough information to catalog. For example, if a resource does not have a publication place and publisher. It was further revealed that the libraries have a challenge to get trained people to create comprehensive accurate metadata. It was also revealed that the challenge of producing quality authority control from the library repository.

6.3 Conclusion

This section provides conclusions based on the major findings of the study. The overall findings revealed that metadata librarians performed descriptive metadata only in libraries. The conclusion drawn from this finding is that metadata librarians use descriptive metadata to assist users to discover the information they are looking for. Furthermore, this type of metadata has proven to be a useful one in the description of digital resources to describe in libraries.

Metadata librarians were aware of the practice of original and copy cataloguing to create their records available for their users. The study findings also established that only qualified metadata librarians must performing the practice of copy cataloguing.

The study finding revealed that types of digital objects used in their libraries are CDs, DVDs, digital artworks, e-books, e-journal articles, e-theses, e-dissertations, e-research data, audio files, MP4 files (videos), TIFF, JPEG files (picture) and PDF that reflect the business value of the library. The conclusion drawn from these findings is that digital objects should have a unique identity to manage the content on the digital resource.

This study found that metadata elements are playing a significant role in the discovery of information in digital libraries. Findings also established that metadata elements are important for describing what record data entails of the library record.

The findings established that the metadata creation popular standards used by libraries in Cape Town are AACR2, RDA, MARC 21, DDC, LCSH, and Dublin Core. The study also confirmed that the reasons use of metadata standards, this is because libraries in Cape Town adopted the popular international standards to share records, keep consistency for the sake of collaboration of digital records.

The study established that records are stored internally and in cloud systems. The study also emphasizes the importance of effective metadata storage for digital resources in digital libraries. The study further concludes that DSpace is the most popular used digital library software.

The study also found that the lack of security in library systems to manage library catalogue. The other challenge is the ongoing changes in ICT that affect metadata creation tasks. Lack of information on resources to catalog to the challenges faced. For instance, if the resource does not have a publication place and publisher. These challenges were identified in this study and the literature confirmed them. The following section presents recommendations that could be improved to these conclusions.

6.4 Recommendations

The recommendations are based on a correlation between the findings of the study and the literature reviewed.

The following recommendations are made:

- Metadata librarians should get training in authority control and quality control to manage their metadata through Library Information Studies School (LIS).
- Metadata librarians should be involved at all levels in the development of new library management system (LMS). This will ensure that the lack of security in the library system overcome.
- Metadata librarians should get training on ICT skills that affect metadata creation and management through LIS school. This is in line with Cerbo (2011) in Nwosu (2014) highlighted that new cataloguing environment has changed more into the digital environment, it is difficult to adapt data created according to old principles with innovations in information technology. This is because metadata librarians need to stay relevant because of ongoing changes in ICT that affect metadata creation and management tasks.
- Metadata creation section should have metadata creation policy, metadata librarians will adhere to when creating the metadata resources. This is the best tool to manage metadata creation.

6.5 Areas of further research

The same research approach used in this research should be done again and try to prevent the challenges found in this study. This study is recommended to have many participants for each library working in metadata creation and management, not just two. Therefore, recommended future studies are:

- A comparative study on metadata creation and management and the role it plays in the digital preservation of resources in selected libraries in South Africa.
- The current study recommends further studies be extended to cover cataloguing policy, metadata creation standards, and tools policy for digital preservation in libraries. These need to be investigated to have standard guidance for metadata creation and management in the preservation of digital information in selected libraries in South Africa.

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APPENDICES

Appendix A: Semi - structured interview schedule for metadata librarian

Preamble

Metadata plays a key role in digital preservation of resources. Metadata enables these resources to be easily stored, accessed, and retrieved. Metadata creation and management are important processes in these endeavours. The objective of the study is to establish the role metadata plays in the digital preservation of resources in libraries.

Thank you for consenting to take part in this interview and for your permission to record the interview. In this interview, I would like to ask you a few questions on this subject. Interview responses will be kept anonymous, and all the data collected will be kept confidential. Participation is voluntary and if you wish to withdraw from the study at any time, you are free to do so.

Interview questions

Section A: Demographic information

1. Name of library:
2. Designation:
3. For how long have you been involved in the creation of metadata in this organization, at any other?

Section B: Metadata creation

4. What type of metadata does your organization create?
5. What tools are commonly used in the creation of metadata?
6. How is metadata created in your organization?

Section C: Metadata for digital preservation

7. What type of digital objects do you have in your organization? Please name them.
8. How is metadata used in the preservation of digital information?
9. What are the most important preservation metadata elements that are used in your organization?
10. How is metadata stored and updated in your digital preservation system? Please explain.

Section D: Metadata standards

11. What metadata standards are used in the creation and management of metadata in your organization?
12. Why do you believe these standards have been chosen?
13. What metadata standards are used in the preservation of your digital collections?
14. Please explain the reasons for choosing the above metadata standards.

Section E: Metadata management

15. Which strategies are used in the managing of metadata in your organization?
16. How does your library system understand and manage administrative metadata? What metadata is recorded?
17. How does your library system understand and manage technical metadata? What metadata is recorded?
18. How does your library system understand and manage descriptive metadata? What metadata is recorded?

Section F: Metadata challenges in digital preservation

19. What challenges do you come across as you preserve metadata in digital preservation in your organization?
20. How do you suggest these challenges can be overcome?

Section G: General comments

21. Do you have any general comments that you would like to add concerning the subject of this study?

Thank you for your time and participation.

Appendix B: Interview consent form for participants

Dear Librarian

My name is Lordwick Bonang Maruping and I am an MPhil specialising in Digital Curation student in the Department of Knowledge and Information Stewardship, University of Cape Town. I am conducting a study entitled “Metadata creation and management in the preservation of digital Information in selected libraries in Cape Town.” The objective of the study is to establish the role metadata plays in the digital preservation of resources in libraries. My research is being supervised by Dr Mzwandile Shongwe.

Your participation in this study would be appreciated. I would like to ask you a few questions. Your answers will be treated confidentially, and your identity will not be revealed at any stage. There are no right or wrong answers.

The study conforms to the ethics standards of the Humanities Faculty of the University of Cape Town.

Please indicate your willingness to participate in the study by answering the following questions. Mark your choice with an X.

Informed Consent:

	Yes	No
I have read and understood the study purpose as described and have asked any necessary clarifying questions		
I understand that I do not have to answer any questions and do not need to provide an explanation		
I consent to the interview being recorded		
I understand that I can end the interview at any point and will not be penalized or victimized if I choose to withdraw		
I understand that my participation in this study is voluntary		
I understand that I will not benefit directly from participating in this study		
I understand that any data that the researcher extracts from the interview for use in reports or published findings will not, under any circumstances, contain names or identifying characteristics.		

Name of participant: _____

Signature: _____ Date: _____

I can be contacted at: Email: MRPLOR002@myuct.ac.za; Cell: + 27 834036548

Thank you for your contribution to this research.

Appendix C: Document Analysis Tool

Document analysis seeks to ascertain the following:

1. The name of the metadata and creation and management policy
2. What does the policy entail in terms of metadata creation and management of digital objects?
   - 2.1. Effective date? Who is accountable for the policy?
   - 2.2. Who is responsible for the creation and management of metadata?
   - 2.3. What are the metadata creation procedures?
   - 2.4. What metadata standards are adopted by the organization?
   - 2.5. What metadata creation tools are used in the organization?
   - 2.6. Is metadata creation and management training provided in the policy?
3. Any other relevant information on metadata creation and management of digital objects

Appendix D: letter seeking authority

Department of Knowledge & Information Stewardship
University of Cape Town
Private Bag X03
RONDEBOSCH
7701
South Africa

Tel: +27 (0)21 650 4546
Fax: +27 (0)21 650 5497
Email dkis@uct.ac.za

Research title: Metadata management in the preservation of digital information in selected libraries in Cape Town

11 April 2022

Department of Knowledge & Information Stewardship,

Faculty
University of Cape Town
Private Bag X03
RONDEBOSCH
7701

Dear Sir/Madam

Re: Request for permission to conduct research at the University of Cape Town Libraries

I, Lordwick Bonang Maruping, am doing a minor research study in the Department of Knowledge and Information Stewardship towards a Master of Philosophy specialising in Digital Curation at the University of Cape Town. I am conducting a study that aims to establish the role metadata plays in the digital preservation of resources in information environments. The study seeks to fulfil the following critical questions:

1. How is metadata created for the preservation of digital information in libraries?
2. What strategies are used to manage metadata for the preservation of digital information in libraries?
3. What best practices must be used in metadata creation and management in libraries?
4. What are the challenges in the creation and management of metadata for digital preservation in libraries?

I hereby request you to grant me permission to collect research data at the University of Cape Town (UCT) libraries in the Discovery Services section. The Faculty of

Humanities, on behalf of the University of Cape Town, has granted ethics clearance for the research. I will abide by UCT research ethics. Anonymity and confidentiality will be maintained, and I will not act in any way that will place the institution in disrepute. I believe that the findings from the study will contribute to the sustainable transfer of knowledge transition of metadata creation and management from the University to libraries.

After the completion of the studies, copies of the thesis will be deposited to the University Library. Findings will also be shared through other platforms such as publications and conferences.

Should you require more information about the study, you are welcome to contact me at: Email: MRPLOR002@myuct.ac.za

Cell: 083 403 6548

Yours sincerely,

Lordwick Bonang Maruping

MRPLOR002

Appendix E: Authority letter from the Western Cape Provincial Library Services

Western Cape Government

Lardwick Borang Maruping

Department of Knowledge and Information Stewardship,

University of Cape Town,

Private Bag x3,

Rondebosch,

7701

Dear Mr Maruping

RE: Appendix B: Letter of requesting of permission from Western Cape Provincial Library Services

1. Thank you for your letter.
2. I hereby grant you permission to collect research data at the Cataloguing Unit in Western Cape Public Library Services from May to June 2022
3. I wish you all the best with your Masters

Kind regards

Signed by candidate

SANI

DIRECTOR: LIBRARY SERVICE

Date: 09/03/2022

Appendix F: Ethics clearance certificate from DKIS

Department of Knowledge & Information Stewardship
University of Cape Town
Upper Campus

Private Bag X1, RONDEBOSCH, 7701 South Africa
Level 5, Hlarganani, The Chancellor Oppenheimer Library
Tel: +27 (0) 21 650 4546 Fax: +27 (0) 21 650 2529
E-mail: dkis@uct.ac.za
Internet www.dkis.uct.ac.za

Ref No.: UCTDKIS2021-10-06

13 May 2022

Mr Lordwick Bonang Maruping
Department of Knowledge and Information Stewardship
Chancellor Oppenheimer Library
University of Cape Town

Ethics approval for Master's research

Dear Mr Maruping

I am pleased to inform you that ethics clearance has been granted by the Ethics Review Committee of the Department of Knowledge and Information Stewardship, Faculty of Humanities, for you to proceed with collecting data for your Master's study on '**Metadata creation and management in the preservation of digital information in selected libraries in Cape Town**'.

As a next step, please ensure that you obtain approval from the relevant ethics committees to collect data at your data collection sites, as necessary.

We wish you well with your data collection and the completion of your research.

Yours faithfully,

Signed by candidate

Mr Richard Higgs
Chair: Department (DKIS) Research Ethics Committee