OPERATIONALISING RESEARCH DATA SERVICES IN ACADEMIC LIBRARIES IN AFRICA: A CASE OF THE UNIVERSITY OF NAMIBIA

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COMPULSORY DECLARATION

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. 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.

Signature Signed by candidate **Date**

Dedication

To my mom and dad, this is for you. The legacy you left behind shall continue to live on. I lift up the burner high to say this work is for you. May you all continue resting in peace. My wish has been for you to have witnessed and celebrated with me all my little steps and accomplishments. I do believe that wherever you are, your faces continue to be lightened up with smiles.

To the people, I love the most - Ezra, Ishmael, Isaac, Isaiah and Ilai.

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Abstract

This study investigated operationalising research data services in academic libraries in Africa by using a case of the University of Namibia (UNAM). The purpose of the study was to enquire the extent to which librarians have the necessary knowledge and skills which will enable them to provide effective research data management services (RDMS) at UNAM; investigate the attitudes of librarians regarding RDMS at UNAM; determine the environmental factors that affect the development of skills and abilities to offer RDMS at UNAM; identify the social influences that affect the operationalising of RDMS at UNAM; identify positive and negative issues related to librarians that affect operationalising RDMS at UNAM; and, if/where necessary, provide the appropriate solutions.

The theoretical domains framework (TDF) was used to guide the study with the view of assessing the knowledge, skills, and attitudes of librarians to operationalise RDMS at UNAM. The study used a mixed methods approach to provide a richer and more reliable understanding of the phenomena under investigation. A questionnaire and interviews were used to collect data. 106 UNAM library staff members across 12 campuses participated in the study.

The results of the study revealed that the majority of respondents who participated in the study were aware of and understood the importance of RDMS to both the institution, researchers and students. Concerning the skills possessed by library staff, attitudes and the environmental context and resources, the study discovered that librarians had a positive attitude towards the library offering RDMS at UNAM, which positions the library well to operationalise RDMS. However, there is a skills gap among the library staff. Furthermore, the study revealed that there is currently no infrastructure to properly operationalise RDMS, as well as no dedicated budget for infrastructure and staff skills development, thereby making it difficult for RDM to develop fully into a service offered in the library at UNAM.

It is recommended that in order for research data management services to be operationalised, there is a need for the institution to have a budget that is dedicated to infrastructure and skills development and the recruitment of adequately skilled staff members. UNAM also needs to have a relevant RDM implementation plan guiding them towards the establishment of RDMS while taking into account their limitations and restrictions concerning human resources, infrastructure

and finances. The school of Library Sciences at UNAM as well should adjust their curricular to reflect the new and emerging roles of librarians in the emerging data driven research environment to fill up the skills gap among librarians in order to operationalise RDMS.

Key words: Knowledge, skills, attitudes, research data management, operationalising research data services, academic libraries

List of acronyms and abbreviations

ANDS	**-**	Australian National Data Services
CPUT	-	Cape Peninsula University of Technology
DCC	**-**	Digital Curation Centre
DIRISA	**-**	Data intensive initiatives of South Africa
DMP	**-**	Data Management Plans
ICT	**-**	Information Communication Technology
TDF	**-**	Theoretical Domain Framework
UCT	**-**	University of Cape Town
UG	-	University of Ghana
UNAM	**-**	University of Namibia
IUM	-	International University of Management
NICIS	-	National Integrated Cyber Infrastructure System
NUST	-	Namibia University of Science and Technology
NSTCC	-	National Science and Technology Council Committee
NRF	**-**	National Research Foundation
PG	-	Postgraduate
RDMS	**-**	Research Data Management Services
RDS	**-**	Research Data Services
RSS	-	Research Support Services
RCS	**-**	Research Centre Services
RDM	**-**	Research Data Management

USA - United States of America

UK - United Kingdom

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1. INTRODUCTION TO THE STUDY

1.1. Introduction

Research data management (RDM) is increasingly becoming important for researchers. Research data which is well managed can be of value and it can be utilised in the future "for new analyses" and the reproduction of research outcomes (Matusiak & Sposito, 2018). Fearon et al. (2013:12) point out that research data management services (RDMS) provide support for how researchers can manage, store, document, share, preserve, cite, and archive their data. Operationalising RDMS can play an important role in managing research data in institutions of higher learning. The study investigated some of the factors that affect operationalising RDMS in the context of a university library in Namibia.

1.1.1. Research data management

Burnham (2013:6) defines research data as data that is generated and manipulated during research. Research data is the foundation of research findings and recommendations for further research and can result in new knowledge (Burnham, 2013:6). Research is cyclical and one of the steps in this regard is data analysis, thus without data, research is incomplete (Burnham, 2013:6).

Sanjeeva (2018:4) states that research data management refers to the handling of data produced during the progression of research. The produced data needs to be managed well for it to be utilised throughout research projects and beyond (Sanjeeva, 2018:4). Whyte and Tedds (2011) point out that RDM has to do with the "organisation of data, from its entry to the research cycle through to the dissemination and archiving of valuable results". It aims to ensure consistent confirmation of results, and it allows fresh and advanced research to be built on present data (Whyte & Tedds, 2011).

RDM is vital because data are a valuable resource (Whyte & Tedds, 2011). Sharing well-managed research data enables others to utilise it and helps to prevent the duplication of effort (Sanjeeva, 2018). Furthermore, RDM is important as it ensures research honesty and authentication of results because there is a possibility of verification and evaluation of the research results (Sanjeeva, 2018). RDM is also vital for the organisation of data for easier retrieval when needed (Sanjeeva, 2018:5). Borghi and Van Gulick (2018:2) point out that effective RDM is crucial to establish the accessibility of data after a project's conclusion, which is "progressively compulsory to data stakeholders including research

funding agencies and scholarly publishers". Lastly, RDM practices make the research process more efficient, facilitates collaboration, and helps prevent the loss of data (Borghi & Van Gulick, 2018:2).

1.1.2. RDMS

Matusiak and Sposito (2017) affirm that RDMS are services that are offered for the purpose of supporting researchers to meet requirements for the management of their research data. Fearon et al. (2013:12) point out that RDMS relate to, for example, data management planning, data archiving, data citation, preservation and curation to support the management, storing, documentation, sharing, preservation and archiving of research data. For an institution to be effective when it comes to data management and sharing, it needs to have a strategy in place on how to establish RDMS (Tang & Hu, 2019:3).

Chiware and Mathe (2016) note that RDMS are being implemented and operationalised in academic libraries world-wide with the aim of supporting university activities. RDM has made significant progress in developed countries such as the United Kingdom (UK), the United States of America (USA), Australia, and Canada (Lewis, 2010). The United Kingdom, for example, has made significant investments in RDM by creating the UK Data Archive and the Digital Curation Centre (DCC), which provide guidance on managing research data (Avuglah & Underwood, 2019:3).

In the United States (US), the National Science and Technology Council Committee (NSTCC) was established to advise on the capability, capacity, and infrastructure in data management cyber-infrastructure for research data curation (Lewis, 2010). In Australia, an initiative was developed in 2008 called the Australian National Data Service (ANDS) to assist in addressing the difficulties of storing and managing research data in Australia, as well as making it discoverable and accessible for validation and reuse (Lewis, 2010).

In Africa, RDMS is still a relatively new phenomenon. In South Africa, according to Chiware and Mathe (2016:1), the National Research Foundation (NRF) encourages the preservation of research data for research that it has financed. There are as well national initiatives with the aim of formulating and implementing national ways on how information institutions should manage their data services. Among the initiatives developed in South Africa to manage research data include the Data Intensive Research Initiative of South Africa (DIRISA) as well as the National Integrated Cyber Infrastructure System

(NICIS) which are putting systems in place for technical infrastructure that will allow data management (Chiware & Mathe, 2016:3).

As part of the library's e-strategic plan and linked to the university's goals, the Cape Peninsula University of Technology, for example, has created platforms, systems and processes for the management of research data and the development of RDMS (Chiware & Mathe, 2016:1). Avuglah and Underwood (2019) allude that, at the University of Ghana (UG), the university needs technical infrastructure to host and provide RDMS.

Chiware and Becker (2018:1) report on the readiness of academic libraries in Southern Africa to provide RDMS in their institutions. Academic libraries are still at an early stage in terms of data service provisions. The study indicated that about 20 libraries are still busy planning on how to provide data support services and those that offer them just started. However, about 31 universities offered more of reference services in areas such as institutional repositories, locating and using data sources, as well as copyright and patent advice than training services (Chiware & Becker, 2018:6).

1.1.3. Implementation of RDMS and staff competencies

Corrall, Keenan and Afzal (2013 in Tenopir et al., 2014:86) state that the development of specialised RDMS is often constrained by knowledge and skills gaps among library staff and lack of confidence in their expected roles. Yoon and Schultz (2017:2) state that librarians sometimes need new skills in order to be able to provide RDMS. Tang and Hu (2019) state that if staff members are not trained on how to provide RDMS, then research data management will not be a success.

To provide RDMS, librarians need data curation skills, technical and ICT skills, knowledge about the research process and research methods as well as knowledge on different disciplines (Kennan et al., 2014:10). Ndhlovu (2016:3) agrees that there is a need for library professionals to be trained on areas such as digital curation and ICT in order to act on opportunities for supporting digital curation activities.

Besides the knowledge and skills of staff members, the implementation of RDMS can also be affected by social influences (Pinfield, Cox, & Smith, 2014:18). As an example, Pinfield, Cox, and Smith (2014:20) state that the power relations between RDMS stakeholders like library managers and IT directors in an institution can either contribute to the effective implementation of RDMS or constrain

it. For Tenopir et al. (2013), the attitudes of stakeholders also play an important part in the effective implementation of RDMS.

To implement RDMS, librarians also need resources. To facilitate the implementation of data repositories, for example, for the development of infrastructure and training of staff, there is a need for a budget that is dedicated to the recruitment of skilled human capacity (Tenopir et al., 2013). Faniel and Connaway (2018:110) discovered that a conducive environment that encourages and provides the resources for the development of skills for librarians to provide RDMS, will affect implementation.

1.2. Background to the study

The University of Namibia has 12 campus libraries namely: Main campus, Khomasdal campus, Southern campus, Ogongo campus, Neudam campus, Oshakati campus, Rundu campus, Sam Nujoma campus, Hage Geingob campus, Hifikepunye Pohamba campus, Katima Mulilo campus, and Jose Eduardo Dos Santos campus (UNAM, 2016). In the University of Namibia Act (No.18. of 1992) it is stipulated that UNAM has a mandate to conduct research; that UNAM must "undertake, advance and disseminate knowledge for the socio-economic development of the nation and beyond". Academic staff members are dedicated to conducting research and UNAM has developed a scholarly communications policy and a research policy (UNAM, 2013:6). However, there is not yet a RDM policy or related RDMS.

According to Ndinoshiho, Eija, and Forsman (2012), the University of Namibia's traditional library services were not responding to top trends in academic libraries because the university library did not include most of the RDMS that can improve research data sharing and accessing. Though the university has made slight improvements targeted at introducing RDMS, UNAM has not operationalised RDMS formally. Since there is no policy mandating and guiding researchers' data practices, Sampuwa (2019) recommended that, as the first step, UNAM needs to give directives in the form of policies to enhance the adoption of RDM practices.

1.3. Statement of the problem

The University of Namibia does not provide RDMS, resulting in individuals having to manage their own data (Samupwa, personal communication 2021, October 8). As such, the University of Namibia has seen the need for RDMS as per the university research policy. In the Technical Services team, there

is a Digital Scholarship and Curation librarian whose role is focussed on the digitisation of theses and dissertations and past examination papers for uploading to the institutional repository. The UNAM library is currently providing data repository services for which the Systems (ICT) department is responsible (Samupwa, personal communication 2021, October 8). While there is a need for formal RDMS beyond the data repository at the institution, UNAM has not reached the point of finalising any services or hiring or training staff, specifically for these services (Samupwa, personal communication 2021, October 8). An investigation of current staff's knowledge, skills and beliefs about the capabilities, environmental context and resources, and social influences related to RDMS would shed some light on how effectively UNAM could operationalise RDMS. The current research, therefore, undertook an investigation on operationalising research data services at the University of Namibia in order to explore staff capabilities in light of the need for effective RDMS at the institution.

1.4. Objectives of the study

The study aimed to do the following in the interest of investigating the research problem:

1) Find out to what extent librarians have the necessary knowledge and skills which will enable them to provide effective RDMS at UNAM;
2) Investigate the attitudes of librarians regarding RDMS at UNAM;
3) Determine the environmental factors that affect the development of skills and abilities to offer RDMS at UNAM;
4) Identify the social influences that affect the operationalising of RDMS at UNAM; and
5) Identify positive and negative issues related to librarians that affect the operationalisation of RDMS at UNAM, and, if/where necessary, appropriate solutions.

1.5. Research questions

1) What knowledge and skills do academic librarians have to provide library-based RDMS at UNAM?
2) What are the librarians' attitudes regarding the RDMS for their libraries and their institutions at the UNAM?
3) What are the social and environmental factors that contribute to or inhibit the engagement of librarians in RDMS within the University of Namibia?

4) What are the positive and negative issues related to librarians that affect operationalising RDMS at UNAM?

1.6. Rationale of the study

This research contributes towards the knowledge that already exists on RDMS, the importance of RDM and how academic libraries should operationalise RDMS. Secondly, despite so many RDMS studies done around the world, there is none that has so far focused on RDMS specifically at the University of Namibia. Thirdly, this study is an opportunity to assess the readiness of the University of Namibia when it comes to operationalising research data services, identify staff capabilities when providing RDMS in the library, identify the challenges faced by academic libraries when it comes to RDMS, and provide possible solutions or give recommendations on how academic libraries should address RDMS challenges at UNAM.

1.7. Overview of the research methodology

This study used the pragmatist research paradigm and employed an explanatory mixed methods design. The study used a questionnaire as a research instrument for the quantitative part of the study, which was the first phase of data collection. The second phase of data collection was through focus group interviews. The population of the study was UNAM library staff members from all 12 campuses. A census was used for the questionnaire and purposive sampling for the focus group interviews.

1.8. Delimitations of the study

The study was delimited to UNAM libraries and therefore did not intend for generalisation to be possible across academic libraries in Namibia or elsewhere in the world. The study was guided by the Theoretical Domains Framework (TDF) and chose to use only five of the 14 TDF domains.

1.9. Outline of the report

The first chapter defines research data and RDM and briefly outlines the importance of RDMS and the development of RDMS both locally and globally. The background information, the research problem, the research objectives and research questions, the study's rationale, limitations, and an overview of the research methodology are also discussed. The second chapter discusses the theoretical framework and reviews the literature on RDMS in academic libraries.

The third chapter outlines the research paradigm, approach, design, and methods, and it also describes the study population. The fourth chapter presents the data and the fifth chapter discusses the main findings, conclusions, recommendations, and future directions that have emerged from this research.

1.10. Chapter summary

The chapter provided the background information, problem statement, research objectives and research questions, and rationale of the study. Furthermore, the chapter provided a brief introduction to the research methodology used in the study and discussed the study's delimitations. The thesis structure was also outlined.

2. LITERATURE REVIEW

2.1. Introduction

The chapter starts with a discussion of the theoretical framework guiding the study which is the Theoretical Domains Framework (TDF). Secondly, there is a discussion about the types of RDMS services offered in academic libraries. Through a review of the available literature, the chapter critically examines the themes arising from the research objectives of the study, namely the knowledge, skills, attitudes, and the environmental factors and social influences that affect the operationalising of RDMS. Finally, positive and negative issues related to librarians that affect operationalising RDMS are discussed.

Du Plooy-Cilliers, Davis and Bezuidenhout (2014:101) define a literature review as a process of searching, evaluating, reading, and summarising the literature that is similar to your research topic. Du Plooy-Cilliers, Davis and Bezuidenhout (2014:101) further write that a literature review helps to identify information gaps and it helps to determine any relationships between topics and variables that are important to your research purpose and problem. The literature used came from the USA and other western countries, and additionally, the researcher used literature from Africa and Asia and the Caribbean to complete the chapter. Most of the literature is from studies conducted in academic libraries.

2.2. The Theoretical Domains Framework (TDF)

According to Adom, Hussein and Agyem (2018:438), citing Grant and Osanloo (2014), a theoretical framework is a guide for research. Adom, Hussein and Agyem (2018) further assert that it is based on existing theory in a field of inquiry and can be used to guide the research design and data analysis. This study chose to use the Theoretical Domains Framework (TDF). TDF was developed under the discipline of health, for the main purpose of identifying what influences the behaviour of health professionals on implementations of "new practices or changing of existing practices" (Aktins, et al., 2017:2). Atkins et al. (2017) write that TDF is a mixture of 33 theories of behaviour and behaviour change with 14 domains. The domains underpinning TDF are: knowledge, skills, social/professional role and identity, beliefs about capabilities, optimism, beliefs about consequences, reinforcement,

intentions, goals, memory, attention and decision processes, environmental context and resources, social influences, and emotion (Atkins et al., 2017: 2; Richardson et al., 2019: 2).

Below (Table 1) is the mapping of the domains according to Atkins et al. (2017).

Table 1. Theoretical Domain Framework (TDF): domains and component constructs. (Atkins et al., 2017)

Domains and their definitions	**Component construct**
Knowledge An awareness of the existence of something	Knowledge (including knowledge of condition/scientific rationale); procedural knowledge; knowledge of task environment
Skills An ability or proficiency acquired through practice	Skills; skills development; competence; ability; interpersonal skills; practice; skill assessment
Beliefs about capabilities Acceptance of the truth, reality or validity about an ability, talent or facility that a person can put to constructive use	Self-confidence; perceived competence; self-efficacy; perceived behavioural control; beliefs; self-esteem; empowerment; professional confidence
Environmental context and resources Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence and adaptive behaviour	Environmental stressors; resources/material resources; organisational culture/climate; salien events/critical incidents; personal environment interaction; barriers and facilitators
Social influences Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviours	Social pressure; social norms; group conformity; social comparisons; group norms; social support; power; intergroup conflict; alienation; group identity; modelling

One of the objectives of the study was to find out to what extent librarians have the necessary knowledge and skills which will enable them to provide effective RDMS at UNAM. Therefore, the framework was used to guide the assessment of the knowledge and skills of librarians related to RDMS.

Likewise, the framework was used to assess beliefs about capabilities (the attitudes of librarians regarding RDMS), the environmental factors that affect the offering of RDMS at UNAM (such as availability of infrastructure, human capital, and budget) and the social influences that affect the operationalising of RDMS at UNAM. TDF was used to design research instruments and it informed data analysis.

Many studies have used TDF, however, few have used it in RDM research. Krahe et al. (2020) conducted a cross-sectional survey among health researchers at a Griffith University (Australia) research institute to determine the obstacles and facilitators to data sharing and to identify how behaviour could be changed. Using the TDF allowed the study to align the identified obstacles of data sharing such as lack of understanding of data sharing, lack of experience, lack of resources, and funding, to behaviour domains.

2.3. Research data management services offered in academic/research libraries

Becker (2018) points out that academic and research libraries have been part of the collaborative efforts and initiatives when it comes to offering new RDMS in academic libraries. Tenopir et al. (2014) found that academic libraries were suitable to offer RDMS because they were already involved in the curation of research data where 12.2% of libraries were already providing support for data curation. Furthermore, the majority of data managers, including those not working in libraries, highlighted in the study that their institutions had a policy on research data which serves as a baseline to offer RDMS (Tenopir et al., 2014).

Lewis's (2010) study on whether the research data management role was for libraries or not found that libraries were in a better position to handle the growth of research data management and provide RDMS in academic institutions because most libraries had an existing scholarly communication policy, which serves as a good starting point. Furthermore, the study found that research data was just an extension of other services which were already offered in libraries (Lewis,2010).

Yu (2017:4) found that "librarians and data technicians fully agree that many RDMS are not fully utilised in academic libraries because many services are still at the planning stage in libraries". Therefore, to ensure that researchers fully utilise RDMS in the library, there is a need for effective communication taking place among departments to create awareness which might strengthen library

relationships with external entities or internal departments on the utilisation of RDMS which improves the management of research data (Bradley, 2018:21).

Here are some of the RDMS that academic libraries offer.

2.3.1. Advisory services

Studies show that academic libraries provide several advisory services for researchers. Advisory services entail all training services that are offered in academic libraries to researchers and staff and, in the case of RDMS, are those such as preparing data management plans (DMPs) before applying for funds and grants when conducting research (Cox et al., 2017).

Training services are important because they help with improving skills and attitudes towards the implementation of new services, thus enhancing the services that the library provides (Abban, 2018). Abban (2018) in Ghana established that training services were very important.

A study by Cox et al. (2019) assessed and captured how library RDMS have developed and impacted the nature of academic libraries in Australia, Canada, Germany, Ireland, the Netherlands, New Zealand, the UK and USA compared to data from 2014. The study showed that the advisory services made up most of the RDMS provided and this included DMPs, data discovery, copyright support, and web guides. Tang and Hu's (2019) survey on RDMS in academic libraries in North America, Europe, Asia/Pacific/Middle East, Africa, and South America found that researchers needed training on data storage, DMPs, data sharing and preservation. Tang and Hu (2019:98) found that academic libraries were providing data training for librarians on things such as data services, basic training, and data training on reference interviews to ensure that librarians have RDM data service skills. They also provided training for researchers on data sharing, data preservation, DMPs, and metadata. Similarly, Read et al. (2019) discovered that librarians provided libguides and classes/workshops on RDM. These are forms of advisory service and libguides on data organisation are one type of RDM-related libguide (Tang & Hu,2019).

Cox et al. (2017) proffer that when it comes to the degree of development in libraries on RDMS, 81.8 % of academic libraries provided data organisation, whereas in other academic libraries, the level of RDMS development showed that 42.9% provided services on data organisation. Cox et al. (2018:1438)

reported less provision of the following advisory services: data analysis, data visualisation, data mining, and data cleaning compared to DMP, web guides, data discovery and support on copyright.

Cox et al. (2017:2189), in their survey on the developments in RDMS in academic libraries, distinguished between advisory and technical RDMS. A large number of participants in this survey surprisingly stated that their libraries were not having data advisory services or that their advisory services were "basic" (Cox et al., 2017:). Cox et al. (2017:2189) discovered that web guides were the most common RDMS, followed by RDM training.

Yoon and Schultz (2017:927) found that in the USA, 34% of libraries were providing data-related training as part of their advisory services on topics such as data sharing and reuse. Moreover, Liu and Ding's (2015) survey found that 57.7% of libraries that participated in the study needed data advisory services/consultation services.

One important advisory service is data management planning. For the European Commission of Directorate-General for Research and Innovation (2016:4), data management plans comprise of how data will be shared, collected and processed, standards that will be used, and how the research data will be handled during and after the end of the project. Parham et al. (2016:54) state that the fundamental purpose of a DMP is to "describe the data resulting from a project, and how they will be made publicly accessible for reuse".

Mushi, Pienaar and Van Deventer (2020:3) highlight that DMPs are considered a vital element of research data management. Tang and Hu (2019) discovered that 81% of the libraries they surveyed were providing DMP services. A survey by Chiware and Becker (2018) on RDMS in Southern Africa indicated that 17% of academic libraries had DMP services in place. The survey sought to establish if libraries had online resources related to DMPs for research grant funding agencies or links to DMP tools, and found that among the surveyed libraries, 61% showed that there were no DMP services offered by the library or the institution, and 22% indicated that they had no online resources related to DMP services.

Yoon and Schultz (2017) affirmed that in the USA, data management planning was the second most provided RDMS, with 41.1% of academic libraries showing that they were offering this service. Tenopir et al. (2017) discovered that 45% of academic libraries surveyed in Europe provided DMP services to researchers and students. Tenopir, Birch and Suzie (2012) found that 20.5% out of 221

academic libraries in their study on RDMS were providing DMP consulting services and 22.2% were planning to offer DMP services in the future.

2.3.2. Technical services

Technical services are very important in academic libraries and comprise of metadata services, repository services, data deposit, and data archiving. They include those related to "data catalogue, creation and transformation of metadata sets, and curation of active data" (Cox et al., 2017:2189).

Metadata services entail describing an information resource so that is easily usable, accessible, and retrievable (University of Cape Town, 2018:4). Ma (2019:1) says that metadata standards should be used for long term preservation of research data. Yoon and Schultz (2017:927) reported that 61.1% of academic libraries in their study provided metadata standards services and assisted researchers on how to effectively organise data files. Cox et al. (2017:2191) state that metadata services were offered as RDMS in Australia. Farnel (2016) state that in Canada, several libraries have developed metadata services and the libraries that developed metadata services created metadata services positions in support of the services introduced in their libraries.

A survey by Whitmire, Boock and Sutton (2015) on RDM practices at Oregon State University in the USA revealed that metadata services were provided. However, researchers were not using approved metadata standards which called for training on how to implement specific metadata standards using the available tools.

Tenopir (2014:87) found that most of the libraries in their survey of academic research libraries in the USA and Canada were providing consultation services on metadata creation. A study by Yanez (2009) on the implications of metadata in academic libraries pointed out that metadata services are important because they help to provide access points to a vast amount of data through the description of data sets for easier access and retrieval by researchers and students.

Gowen and Meier (2020:3) state that institutional repositories (IR) in the libraries are addressing researchers' growing need to manage their research data. Moreover, Uzwyshyn (2016:16) state that data repositories are used to manage, share, access, and archive researchers' datasets.

Data repositories can also be used for long term preservation and this stretches to issues of publishing data, the accessibility of data, the discoverability of data, the reusability of data, and the securing of

research data (Ma, 2019:2). Cox et al. (2018: 1438) discovered that a repository is one of the most provided technical RDMS. Mancilla et al. (2019:10), at Delft University of Technology in the Netherlands, found that although some researchers were using repository services, others reported that they were unaware of such services.

Cox et al. (2017) proffer that academic libraries were providing data repository services and it was also discovered that despite the high development of RDMS in the developed world, there is a low level of data repository services that were reported in countries like Ireland, Australia, Germany, the Netherlands, Canada and the UK, where data repository services were only limited to data archiving and data storage.

Other studies discovered relatively low usage of the institutional repository services (Whitmire, Boock & Sutton, 2015:392; Van Tuyl, & Michalek, 2014:10). Data archiving is the "process of identifying and moving data from the primary storage into a secondary storage for long term storage" (Outsystems, 2020). Chiware and Becker (2018:9) discovered that archiving services were mostly either offered outside the library or not offered at all in academic libraries in Southern Africa. From their study, just one respondent reported that his library provided archiving services; whereas six reported that they were offering data archiving assistance (Chiware & Becker, 2018). In the study, ten libraries stated that data which was archived was related to publications, theses and dissertations (Chiware & Becker, 2018). Compared to other services, research data management archiving services are only limited to preserving data that is no longer active for long term preservation and accessing for future use

Data deposit refers to the depositing of data sets into a data repository for storage, preservation and providing access to users (Ma, 2019). Data deposit can help ensure that data is preserved for a longer period of time (Ma, 2019:1). Yoon and Schultz (2017) mention that libraries encouraged researchers to deposit their data sets in the data repositories. A data deposit service, therefore, entails collecting research data and preparing it for deposit into institutional repositories or data repositories.

The survey by Chiware and Becker (2018) found that some respondents were provided with help concerning data deposits whereby other respondents detailed that they were not assisted with depositing data. A total of 85% of academic libraries stated that there was no limitation on the size of data deposit and it was also reported that five researchers did self-depositing of their data while in other cases the library provided assistance with data deposits on behalf of the researchers (Chiware & Becker 2018:9). Lack of awareness, skills, and knowledge of librarians and researchers were some of the

causes of the lack of usage of an institutional repository to deposit research data sets but a dedicated data deposit service can be offered within the surveyed academic libraries. A study by Corrall, Kennan and Afzal (2013:654) on RDMS in 140 libraries found that a lot of libraries were providing supporting data deposit services. Half of the respondents in Australia and Ireland reported that they were providing data deposit services, and other countries stated that they would provide such support in future.

2.3.3. Outreach and collaboration services

Studies show the various outreach and collaboration services that are related to RDM. Oxford English dictionary (2004:280) defines collaboration as working together. In the context of this study, it means a library working together with internal departments or external entities to provide RDMS, for instance, a library working together with Dspace or Figshare or other external libraries in storing, preserving or archiving research data for re-use.

Oxford English dictionary (2004:1017) states that outreach comprises of an organisation's involvement with or influence in the community. Chiware and Becker (2018:10-11) proffer that the most effective outreach method was faculty promotion road shows. The method used by all respondents which was seen as not effective was website links which are cross-posted to other library site pages. Chiware and Becker (2018) further mention that 12 of the 57 academic libraries surveyed indicated that they had collaborated with other departmental units and faculties to provide RDMS, while other libraries showed low partnership with other external libraries when it comes to collaborations to provide RDMS.

Tenopir et al. (2014:88) report that librarians engage in outreach services through a partnership with RDMS providers on campus. Moreover, it was revealed that librarians also collaborated externally, such as participating in working groups or other professional groups about RDMS. Whyte (2014) surveyed senior managers in UK Higher Education and found that there was a high level of collaboration on RDMS. Unfortunately, the study did not indicate where exactly. Tenopir et al. (2014:87) found that outreach and collaboration services were the least offered RDMS in academic libraries in the USA and Canada.

2.4. Factor affecting the provision of RDMS in academic libraries

The factors that this study are interested in that can affect the operationalising of RDMS are now discussed.

2.4.1. Knowledge and skills

Henderson and Knott (2014) proffer that if academic libraries have the desire to introduce RDMS, they need to have professionals who are skilful enough to handle the new offerings. Similarly, Cox et al. (2017:2194) assert that for librarians to offer RDMS, they need to be armed with the skills, knowledge, and competencies on RDMS. This could involve training current staff to acquire the necessary skills or perhaps hiring people who already have the required skills (Henderson & Knott, 2014). Ohaji, Chawner and Yoong (2019) point out that librarians need to be equipped with the necessary knowledge and skills as this will enable them to curate research data in order to support RDMS. The study by Bothma et al. (2018) mentions that to ensure that RDMS are offered in academic libraries, there is a need for institutions to provide a budget and sufficient funding for the recruitment of skilled human capacity.

Cox et al. (2017:2191) point out that the lack of skills among library staff is the reason why staff members lack the confidence to provide RDMS. Similar results were replicated in the Netherlands, UK, Australia, and Ireland, where it was found that staff members identified a skills gap among librarians to provide RDMS (Cox et al., 2017:2191).

A study by Frederick and Run (2019:11) on the role of academic libraries in RDM in Ghana points out that librarians need training on RDMS respectively on technical as well as informational services such as communication, advice, discovery and retrieval of data sets, and marketing of RDMS. Librarians who have the technical skills will be able to develop their networking skills to collaborate on different discipline-specific needs such as Ghana's "digital humanity working group" which paves a way for researchers to "exchange ideas" and get updates on new trends on RDM service issues (Frederik & Run, 2019:3). Through the exchange of ideas, librarians acquire further skills or knowledge on RDMS. Cox, Verbaan and Sen (2012) proffer that librarians are well networked, thus making the effective operation of RDM possible. However, skilful librarians focusing on RDM need to minimise their ordinary librarian duties. Knowledge in RDM is highly recommended as this will help librarians to assist researchers with their data management (Cox, Verbaan & Sen, 2012).

To ensure that librarians are equipped with the necessary skills to effectively offer RDMS in academic libraries, Chiware and Mathe (2015) suggested that special skills programmes be designed and developed for academic libraries to enhance the skills of librarians in RDMS. The skills suggested for

librarians are as follows: plans and policy formulation skills; communication and collaboration skills; networking skills; and data management skills (Chiware & Mathe, 2015).

Fredrick and Run (2019) state that librarians do not have the IT skills and information management skills, which could be a challenge when it comes to such tasks as metadata creation or data management. Contrary to the findings of Fredrick and Run, an earlier study by Lewis (2010) pointed out that librarians have always had skills in metadata because of their work with, for example, cataloguing standards like MARC and AACR, as well as information science skills which equipped them to be research data managers, and recommended that what is needed to be able to effectively offer RDMS is just to provide basic research data infrastructure and basic training that is offered through short courses for data librarians.

Corrall (2012:1) also reported that librarians have the necessary skills and knowledge to deliver RDMS. The study interestingly states that librarians in the USA have the skills because they have worked on the “national developments in RDM”, therefore they can assist colleagues to "understand the nature and importance of data management" (Corral, 2012). Corrall (2012:9) further state that librarians possess data skills because in academic libraries, postgraduate teaching and research training is a priority for library efforts.

Tenopir et al. (2019) investigated the RDMS practices of librarians in the USA and Canada in academic research libraries aiming to ascertain the librarians’ capability and enthusiasm to provide research data services. The study found that the majority of librarians have “the skills, knowledge, and resources available to provide or develop research data services” (Tenopir et al., 2019:28). Those with a lack of skills and knowledge can be assisted through professional growth opportunities (Tenopir et al., 2019:36).

2.4.2. Librarians’ attitudes and beliefs about their capabilities to effectively offer RDMS in academic libraries

Tenopir et al. (2012:70) surveyed librarians concerning how prepared they are to provide RDMS and their attitudes concerning the significance of RDMS for their libraries and institutions. Librarians that have a responsibility in RDMS acknowledged that they have the necessary skills, knowledge, and training to provide RDMS and those with no responsibilities in RDM said that they did not have the skills and knowledge on RDMS (Tenopir, 2012:72). With regards to attitudes, librarians that are

involved in RDMS see these services as being of equal importance to other activities in the library, while those that are not involved in RDMS found RDMS to be less important. This shows that librarians have different attitudes towards RDMS (Tenopir, 2012:73).

Nelson and Goben's (2018:4) study in the USA and the Caribbean assessed the current position of librarians in terms of their RDMS knowledge, behaviour, and attitudes. The study revealed that some librarians had the necessary skills and knowledge to provide the services (Nelson & Goben, 2018). While some librarians were trained, their attitudes were impacted for them to assist researchers with the relevant data. Librarians' attitudes were transformed towards discussing RDM with researchers and thus fully believe that they can assist with finding campus resources (Nelson & Gebon, 2018:14). Librarians need full support in the form of training to come up with RDMS that will cater to academic departments on campus (Nelson & Goben, 2018:14).

However, a study by Corral, Kennan, and Afzal (2013) pointed out that developing RDMS in libraries seems to be constrained not only by to the knowledge gap and skills possessed by library staff but also by a lack of confidence of librarians in their new roles in RDMS.

2.4.3. Social and environmental factors that contribute to or inhibit the engagement of librarians to offer RDMS

Studies reveal that there are several social and environmental factors that contribute to or inhibit librarians' engagement in offering RDMS. Frederick and Run (2019) found that despite academic libraries in Ghana being well-centred to play an important role in RDM, they do not have the infrastructure for managing research data. Furthermore, many researchers at the University of Ghana did not see libraries as a place to turn to for their RDM, which suggests that an institutional culture can be a factor and impediment inhibiting librarians from engaging and offering RDMS (Frederick & Run, 2019).

The Tenopir et al. (2014) study revealed that the establishment of RDMS by libraries has been driven by RDM mandates by research funding bodies, which has motivated academic libraries to take action (Tenopir et al., 2014). The needs of faculty members and students in terms of accessing research data for re-use is one of the social factors that has led to librarians practicing RDMS (Tenopir et al., 2014).

Knight (2015) explains that a study conducted in 2002 highlighted that data management services were needed at the London School of Hygiene, which resulted in pressure from academics to establish these

services, thus illustrating how environmental and social factors played a role in the establishment of and engagement of librarians with RDMS. Chiware and Becker (2018:8) point out that the initiation of RDMS in academic libraries in Southern Africa was as a result of social influence, where participants in their study indicated that RDMS were initiated to assist researchers who requested for assistance with data management, data sharing and data preservation. Therefore, researchers requesting for assistance was influential in implementing RDMS.

2.5. Positive and negative issues on operationalising RDMS and appropriate solutions

Studies show that several challenges consistently affect the operationalisation of RDMS. A survey by Fearon et al. (2013) highlighted a variety of challenges of RDMS such as lack of collaboration/partnerships, lack of adequate funding for infrastructure development, lack of staff training, and lack of financial support and funding. Lack of collaboration was also indicated as a challenge by Tang and Hu (2019:98). Similar results were reported by Faniel and Connaway (2018) where challenges such as lack of human resources and lack of collaboration and coordination, technical resources, communication, leadership support, and the negative perception of researchers in relation to libraries providing RDMS were highlighted. Cox et al. (2017:2182) revealed challenges such as a lack of skills and capabilities among staff, lack of resourcing, and lack of support from researchers and management to support RDMS. Hamad, Al-fadel and Al-soub (2021) identified several similar challenges of RDMS in academic libraries which are as follows:

- Lack of budget for infrastructure and staff skills development;
- Lack of staff with experience on RDM; and
- Lack of library management awareness about libraries' role in providing research data support.

Faten, Maha and Aman (2019:17) state that the perception of staff members that their role was to provide information support rather than technical support also hindered RDMS in academic libraries. Tang and Hu (2019) discovered that marketing and outreach services, inadequate staff numbers, lack of skills, poor bandwidth, and staff unwillingness to learn about RDMS as well as misconceptions about RDMS were some of the obstacles. Chiware and Becker (2018) identified the following challenges as being related to RDMS in Southern Africa:

- Lack of budget for RDMS;
- Researchers lack an understanding of RDMS;
- Lack of training programmes on RDMS;
- Librarians lack the skills to assist researchers in the storage and preservation of data;
- Lack of IT infrastructure; and
- Organisational structural issues and lack of a policy on RDMS.

2.6. Chapter summary

This chapter looked at the theoretical framework behind the study and presented some important aspects pertaining to RDMS. The chapter further discussed themes arising from the research objectives. The next chapter looks at the research design and methodology underpinning the study.

3. RESEARCH DESIGN AND METHODOLOGY

3.1. Introduction

This chapter starts with a discussion of the research approach and design and research methods, and it specifies the instruments used for data collection. The population of the study, reliability and validity are also discussed. The next section of the chapter explains how data were analysed, and ethical considerations of the study are discussed. The last section gives a summation of the chapter.

3.2. Research paradigm

According to Guba (1990:17), a research paradigm is a "set of beliefs that guide action or an investigation". There are several paradigms such as positivism, postpositivism, interpretivism, pragmatism, critical, and postmodernism research paradigms (Creswell, 2014:7). This study used the pragmatist research paradigm. Pragmatism originates from the Greek word pragma which means action (Kaushik & Walsh, 2019:2). Creswell (2014:10) defines pragmatism as a research paradigm that assumes that a researcher should use a methodological approach that works for the research problem and research questions under investigation. Creswell (2014:10) underlines that pragmatism provides the philosophical basis for research:

- Pragmatism does not use one system of philosophy and reality, implying that a pragmatic paradigm can represent multiple realities; and
- Researchers have the freedom to choose which method, techniques and procedures best meet their needs and purpose.

This study adopted pragmatism because it provides multiple perspectives and the researcher can collect data according to “what works” to address research questions.

3.3. Research approach

According to Creswell (2014:3), research approaches are “plans and procedures taken by researchers for the purpose of spanning the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation". There are three research approaches: quantitative, qualitative, and mixed

methods (Welman, Kruger, & Mitchell, 2005:8). Okeke and Van Wyk (2015:209) describe qualitative research as an approach that emphasises the meaning that individuals attach to the phenomena under study. In qualitative research, the reality is socially constructed. In contrast, the quantitative research approach involves measurements and analysis of causal relationships between variables (Welman, Kruger & Mitchell, 2005:8), using numerical data to study a situation.

This study adopted a mixed methods approach. Mixed methods is the combination of both qualitative and quantitative research approaches to investigate a phenomenon (Creswell, 2014:4). Creswell (2014:4) states that the mixed method approach was developed to capitalise on the drawbacks of the qualitative and quantitative research approaches. The present study used a mixed methods approach due to several reasons. According to Cohen, Manion, Marrison (2018:32), using mixed methods provides a richer and more reliable understanding of phenomena under investigation than a single approach would yield. Creswell and Plano Clark (2011:61) suggest that mixed methods brings multiple views from participants, thereby increasing the usefulness and credibility of the results, and it allows the reviewing of unexpected results. Several authors are in agreement that pragmatism can make use of mixed methods (Biesta, 2010:2; Creswell, 2012; Okeke & Van Wyk, 2015:180).

For this study, the problem statement and research questions are such that they can be guided by the combination of quantitative and qualitative research. Therefore, to respond to the research questions of the study, a mixed method approach was selected. Ivankova and Wingo (2018:980) document that mixed methods provide the opportunity for complementarity, triangulation, initiation, development, and expansion. Salehi and Golafshani (2010: 187) explain these concepts as follows:

- Complementarity: one method can make up for shortcomings of the other. For example, if quantitative methods are used in a study to collect data, then qualitative methods can be used in the same study to illustrate or explain the results of the study;
- Initiation – where new insights are obtained which will stimulate new research questions;
- Development – results from one method shape another method. The results through one method can be used to inform the development of another method in the same study, for instance, when a researcher applies the results obtained from quantitative methods to develop qualitative methods or vice versa;
- Expansion – expanding the breadth and the range of the research by using different methods for different lines of enquiry (Emerald, [2023]); and

- Triangulation - research results can be strengthened through the process called data triangulation, which is using different methods that verify research findings and results (Creswell & Miller, 2000:126).

Creswell (2014:222) explains that the mixed method approach has a drawback in that it requires researchers to be skilled in both qualitative and quantitative approaches; for instance, researchers need to be skilled in analysing statistics and text. In the present case, the researcher used the mixed methods for the first time. However, the researcher did his best to minimise this challenge.

3.4. Research design

Creswell and Plano-Clark (2011: 69-70) cite three types of mixed methods designs as follows:

Convergent mixed method design: In this method, the researcher uses both qualitative and quantitative approaches at the same time to explore the phenomenon under study and then merges the two results into an overall interpretation. In this design, the qualitative and quantitative approaches are conducted separately but concurrently and merged at the point of interpretation (Creswell & Plano-Clark, 2011).

Exploratory mixed method design: The researcher uses a qualitative approach to investigate a phenomena and then, building from the exploratory results, the researcher uses a quantitative research approach to measure the situations under investigation for interpretation (Creswell & Plano-Clark, 2011).

Explanatory mixed method design: The researcher explores the phenomenon under investigation using a quantitative research approach before using the qualitative research approach. This implies that the researcher builds on quantitative results with qualitative findings using qualitative data to explain some of what is found in the quantitative data. This study uses explanatory mixed methods interpretation (Creswell & Plano-Clark, 2011).

3.5. Research methods

The study used a questionnaire as a research instrument for the quantitative part of the study which is the first phase of data collection. The second phase of data collection was through focus group

interviews (hereafter, referred to as 'focus groups' or 'interviews'). Focus groups were used to collect qualitative data which was used to explain quantitative data.

3.5.1. Questionnaire

According to Okeke and Van Wyk (2015:317), a questionnaire is a "form of inquiry that contains systematically arranged series of questions that are given to research participants to elicit information for a study." Self-administered means that respondents answer questions themselves without assistance from the investigator (Cohen, Manion & Morrison, 2018:337). Andres (2012:3) states that self-administered questionnaires enable respondents to respond in their own spare time, therefore, respondents may be more thoughtful and reflective. They also allow researchers to collect a large amount of data; ultimately this gives a larger response rate, and data collection can be standardised (Andres, 2012:3). Okeke and Van Wyk (2015:317) and Kumar (2014:160) mention that a questionnaire has the following advantages: it offers greater anonymity, it is cost-effective/affordable, can be geographical distributed quickly and easily, and a questionnaire can be answered by a lot of respondents at the same, thus saving time.

This study used a self-administered online questionnaire to collect data due to the reasons mentioned above. In addition, the interviews were used to collect qualitative data that explained some of what was found in the quantitative data.

According to Andres (2012:7), an online questionnaire can be administered quickly and easily depending on the characteristics of the respondents. COVID-19 was also impactful in influencing the researcher to use an online questionnaire to avoid face to face contact with the respondents. The study opted to use an online questionnaire instead of a paper questionnaire. On the other hand, the researcher was acutely aware of the dangers of using an online questionnaire. Kumar (2014:181) acknowledge several disadvantages such as:

- Potential low response rate when using an online questionnaire. The researcher intended to overcome this challenge by sending two reminders to respondents before the closure of the survey;
- Perception of respondents seeing emails as junk emails (Vans, 2005:202). This was mitigated through sending official emails, with attached ethical clearance from the University of Cape Town and UNAM;

- According to Okeke and Van Wyk (2015:249), an online questionnaire may result in limitations in demographics: the population may be limited to those who have access to computers and who have digital literacy skills; and
- Low response rate and lack of the opportunity to clarify things to the respondents are the shortcomings of a questionnaire (Du Plooy-Cilliers, Davis & Bezuidenhout, 2014:160).

Some of the questions in the questionnaire were formulated based on previous studies (for example, Chiware & Becker, 2018; Tenopir et al., 2019; Yoon & Schultz, 2017).

3.5.2. Interviews

Kumar (2014:176) defines interviews as an interaction between two people where questions are asked by the interviewer to obtain information from the interviewee. Types of interviews include structured, semi-structured, unstructured and focus group interviews (Kumar 2014:176). Patton (2002) states that the advantage of interviews is that they allow respondents to express their minds, thereby giving accurate points of view of their experiences, attitudes, and behaviour. Interviews can gather in-depth information when a researcher probes, information can be supplemented with that obtained through observation of non-verbal reactions, and there is an opportunity for researchers to explain where the respondents do not understand (Kumar, 2014:182). On the other hand, the disadvantages of using interviews are that they are time consuming and there is a possibility of researcher bias, for instance, in framing the questions and interpretation of the responses (Kumar 2014:182).

In the structured interview, the researcher asks pre-determined questions (Okeke & Van Wyk, 2015:299). Kumar (2014:177) explains that when a researcher uses an unstructured interview, he/she has freedom in terms of its structure, content, and question-wording. Focus group interviews involve the moderator leading a discussion between a small group of people on a certain topic (Okeke & Van Wyk, 2015:299). The study conducted a focus group interview as a way to be consistent with all participants. The interviewer had an interview guide with a set of pre-planned core questions for guidance such that the same areas were covered with each interviewee. As the interview progresses, the interviewee is allowed to elaborate or provide more relevant information if he/she opts to do so (Mkwanazi, 2018: 80,). A focus group interview was conducted through Zoom due to COVID19 implications and travelling costs.

An interview guide was used. An interview guide lists the questions that are to be asked in the course of the interview and this ensures some consistency in the inquiry (Kumar, 2014: 195). The advantages of using an interview guide are that it "guarantees cautious use of interview time, enables the interview to be organised and comprehensive by deciding well in advance the issues to be explored and keeps the interactions focused" (Kumar, 2014: 195). Research results that were generated in the interviews were used to explain what was found in the questionnaire data to help to answer the research questions.

3.6. Population and sampling

Quinlan et al. (2015:169) define a population "as a complete group, such as people, that shares some common set of characteristics". The population of the study was the UNAM library staff members from 12 campuses. The UNAM library staff number is 106 and this includes the university librarian, deputy university librarian, subject librarians, IT librarians, library assistants, assistant librarians, cataloguers, acquisition librarians, e-resource librarians, digital scholarship librarians, archivists, and archivist assistants.

Sampling is the process of attaining a representative (sample) from a bigger population (Kumar, 2014:234). The two types of sampling procedures are probability and non-probability sampling (Kumar, 2014: 228). Probability sampling enables every participant to stand a chance of being selected in the study (Kothari 2014:60), whereas non-probability sampling does not (Okeke & Van Wyk, 2015: 224). Okeke and Van Wyk (2015:144) state that it is important to obtain a sampling framework, which Kumar (2014:230) defines as a list of all participants from which the sample was drawn. In this case, the sampling frame was a list of all employees working at the UNAM library.

3.6.1. Quantitative phase – sampling method

A census method was used to collect quantitative data, which entails the selection of all elements in the study population (Lavrakas, 2008). All 106 library staff members were selected to be invited to participate in the study.

3.6.2. Qualitative phase – sampling method

The study used a non-probability sampling method called purposive sampling to select participants for interviews. Purposive sampling was based on the researcher's judgement to select participants that could provide the best information to achieve the objectives of the study (Kumar, 2014:244). Five staff

members who work at the scholarly communication department, special collections, user services, research support services and IT were selected purposively because they are involved in setting up the IT infrastructure that can support the implementation of RDMS.

3.7. Data analysis

Babbie (2010:422) states that quantitative analysis involves numerical representation and manipulation of findings to describe the phenomena under study. Quantitative data was analysed using Microsoft Excel, and research results were presented in graphs and tables. Qualitative data was analysed using content analysis, which refers "to the process of extracting desired information from a text by systematically and objectively identifying specified characteristics of the text (Davis & Meyer 2009).

3.8. Reliability and validity

According to Kumar (2014:213), validity refers to when research instruments measure what is supposed to be measured. Reliability entails when the research instrument is accurate and provides consistent research findings (Cohen, Manion & Morrison, 2018:245). The study ensured the validity of quantitative approach through using literature on RDMS and the TDF model to formulate the questions to enhance the data validity of the research findings. The interview guide and questionnaire were designed to answer the research questions and thus ensure validity and trustworthiness. Questions asked in the questionnaire were informed by studies conducted on RDMS and guided by the TDF model. Interview questions depended on what needed further explanation from quantitative data.

The trustworthiness of qualitative results was ensured through clarifying issues during the discussion, and where necessary, the researchers explained to participants what they did not understand. The questionnaire and interview guide were not tested for reliability however the study used the TDF model, which has been widely and reliably used by other studies, and questionnaire and interview questions were formulated based on other RDMS studies and the literature. The data collected was recorded, documented and analysed carefully to avoid errors.

3.9. Research ethics and ethical clearance

Research ethics are moral principles that guide the researcher (Cohen, Manion & Morrison 2018:111). The researcher asked for ethical clearance first from the University of Cape Town (UCT) and then the

University of Namibia (UNAM) to conduct the study because the study involved human subjects to whom no harm must come.

Everybody participating in the study signed an informed consent form (Appendix A). The researcher made it clear that participation in the study was voluntary, thus everyone had the right to withdraw from the study at any time. Privacy was protected and confidentiality of data was guaranteed.

3.10. Data collection

The researcher waited for ethical clearance from UCT and UNAM before commencing with data collection. Once permission was granted to conduct the study at UNAM, the researcher compiled a list of all UNAM library staff members and invitation letters were sent to the respondents via email. The questionnaire was administered online using Google Forms with a link to access it appearing in the email. Consent was sought from each participant before they could be part of the study.

After collecting and analysing quantitative data, the researcher needed qualitative data to explain some of what was found in the quantitative data. Therefore, the researcher invited purposively selected participants to participate in the qualitative phase. Each participant signed a consent form before partaking in the study. The form made it clear that participation in the study was voluntary; that they had the right not to participate in the study if they did not wish to do so and that they could exit the interview at any stage without facing any consequences. The focus group discussion was recorded. All the recordings were transcribed before they were analysed. The interview was conducted in two parts: on 26 July 2022 from 15:30 PM-17:40 PM and on 28 July 2022 from 10:30 AM-12:30 PM.

3.11. Chapter summary

The chapter discussed the research approach, research design and the research methods that guided the study. The chapter further addressed the issues of population and census, data analysis, validity and reliability, and ethical considerations. The next chapter looks at data analysis.

4. DATA ANALYSIS

4.1. Introduction

This chapter presents the data collected. The first section of this chapter analyses the quantitative data. The second section analyses the qualitative data, and the last part is a summary of the chapter.

4.2. Quantitative phase

The study used descriptive statistics to analyse the quantitative data. According to Cohen, Manion, and Morrison (2018:753), descriptive statistics refers to the process of describing the characteristics of data. The analysis is described systematically as per the questionnaire which is organised into two sections: demographic data and RDMS. Some questions included free text fields and answers to these open-ended questions were grouped into themes and then quantified.

Out of 106 questionnaires sent to UNAM library staff members, 54 (51%) were returned. Babbie and Mouton (2001) affirm that a response rate of 50% is suitable for data analysis and reporting. In the data presentation that follows, 'n' represents the number of respondents for each question. Percentages are not provided for frequencies of 2 or less.

The following section is presented in sequential order as per the questionnaire (see Appendix A).

4.2.1. Section A: Demographic data

This section of the chapter describes the demographic characteristics of the population of the study.

Question 1: What is your occupation?

As shown in Figure 1, many of the participants are library assistants (22; 41%), followed by subject librarians (8; 15%) and senior library assistants and assistant librarians (7; 13% respectively). There were three heads of department and one participant was reported from each of the following occupations: university librarian, scholarly communication librarian, campus librarian, IT librarian, and senior librarian. Library assistants are paraprofessionals responsible for shelving library materials, circulation of library materials, and attending to library queries.

Question 2: What is your highest qualification?

Figure 2 shows that the majority of participants are bachelor's degree holders (16; 30%), followed by master's and diploma holders (12; 22%). Nine (17%) of the participant are honours degree holders. There were four (7.4 %) PhD and one bachelor's honours degree holders.

Question 3: In which department do you work?

As shown in Figure 3, the majority of study participants work for user services (45; 83%). Three work for archives and special collection and for management, two in technical services and one for the systems department.

Question 4: On which campus are you based?

Figure 4 reveals that many participants are based at the main campus (26; 48%), as would have been expected considering that it is the main library. Far fewer responses were received from Khomasdal campus (5; 9%) and Hage Geingob campus (5; 9%), and the rest averaged below 5%.

Question 5: How long have you been working in the UNAM Library?

Figure 5 displays that the majority of the participants fall in the range of 5-10 years (21; 39%), followed by staff members who have worked for UNAM for 11-15 years (15; 28%).

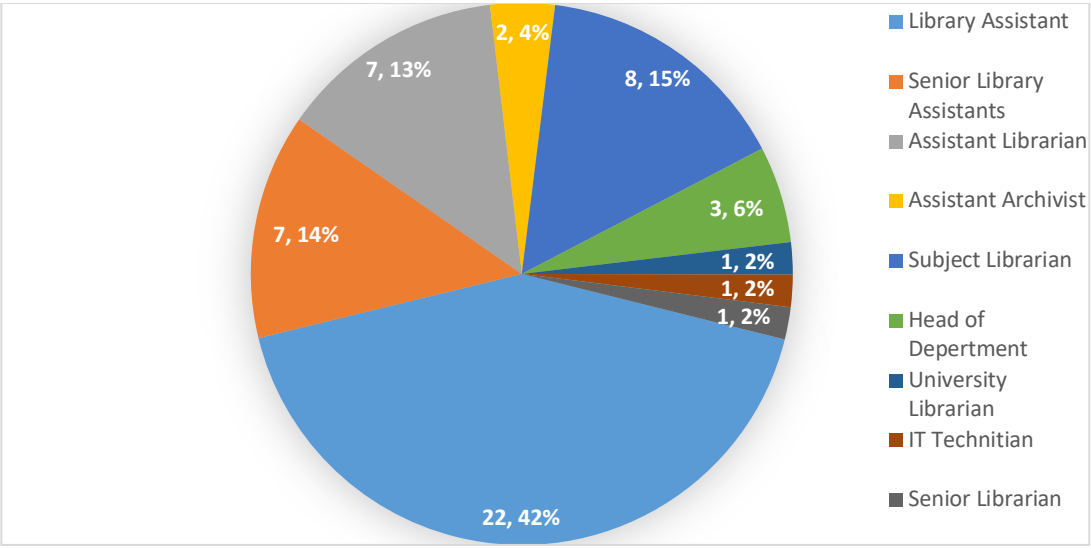

Figure 1. Occupation (n=54)

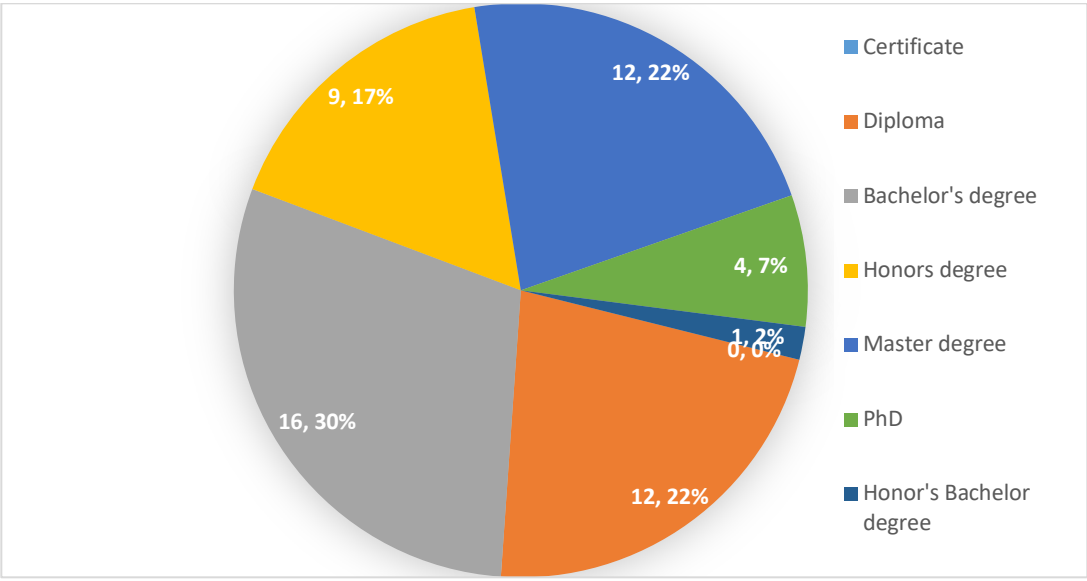

Figure 2. Qualification (n=54)

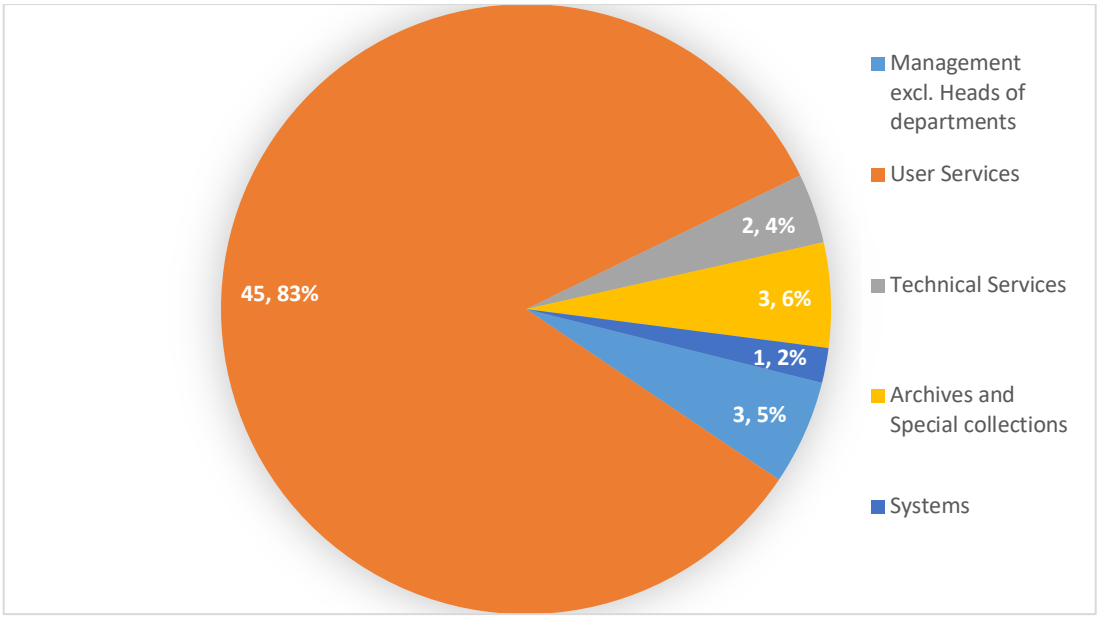

Figure 3. Departments (n=54)

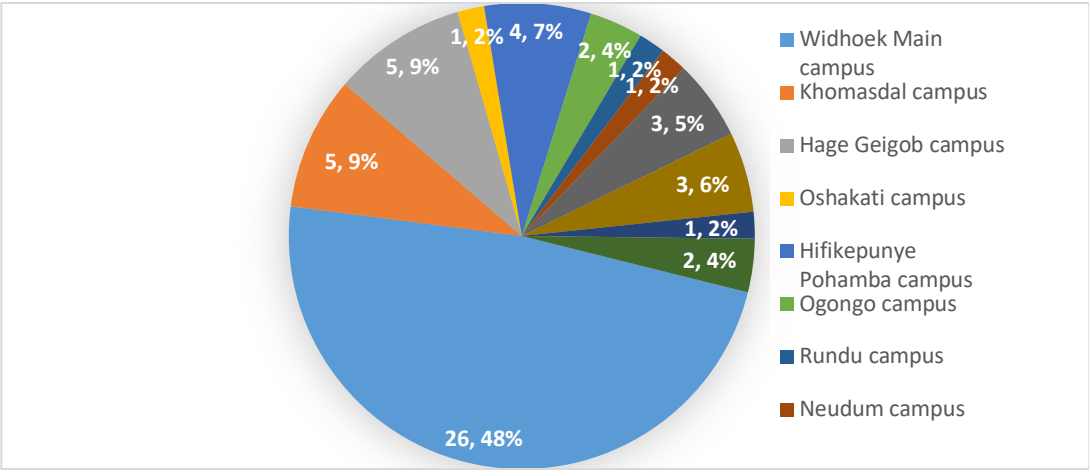

Figure 4. Campus (n=54)

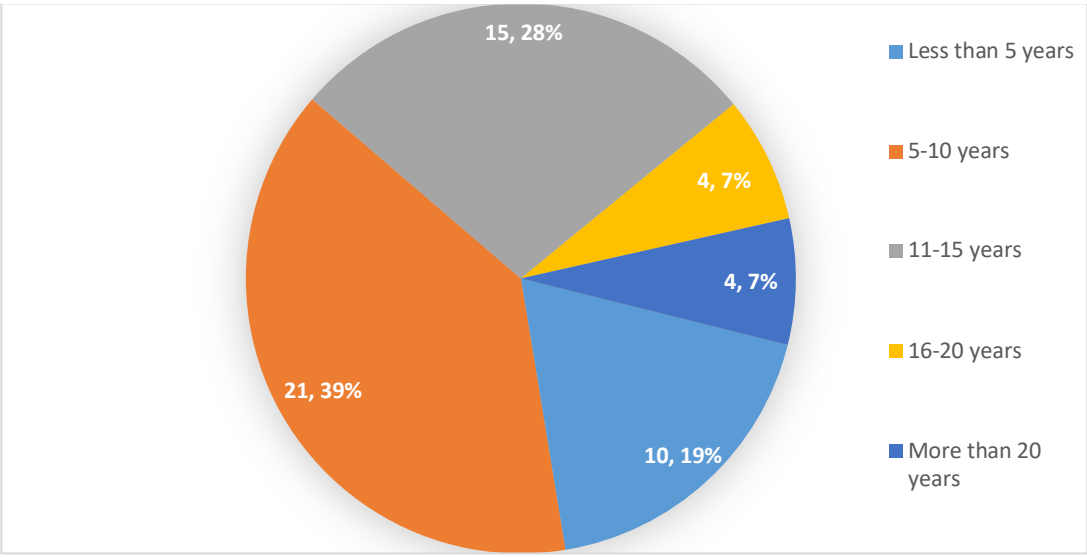

Figure 5. Number of years working at UNAM Library (n=54)

4.2.2. Section B: Research data management services

The questions in this section were posed in relation to the research objectives guiding this study. The section comprises questions pertaining to the knowledge, skills, attitude, environment, and social influences in terms of the TDF model and operationalising RDMS. Question numbers in the sub-headings correspond to those on the questionnaire.

B.1 Knowledge and skills of librarians regarding RDMS at UNAM

Questions were posed to find out to what extent librarians have the necessary knowledge and skills which will enable them to provide effective RDMS at UNAM.

Question 6: What is your understanding of research data management?

Out of 50 responses, 28 participants described RDM in terms of a process which comprises storing, organising, preserving, archiving, sharing, and reusing research data. For instance, one participant described RDM as *"managing data generated by researchers so that it can be reused, shared, accessible, therefore, RDM comprises elements such as creating data, preservation, storing data, describing data, and formulating RDM policies"*.

Eleven (22%) of the participants described RDM briefly as managing research data. Three (6%) of the participants described RDM as the handling and maintenance of research data and 6 (12%) associated RDM with a management system for managing research. Only two out of 50 participants had no idea what RDM is. Drawing from the data, it can the seen that the majority have an understanding of what RDM is.

Question 7: Does your library have a formal RDM policy in place?

Figure 6 illustrates that 27 (50%) of the participants reported that there is no formal RDM policy in place at UNAM. Twenty-one (39%) are not sure if there is an RDM policy in place and 6 (11%) of the participants indicated that there is an RDM policy.

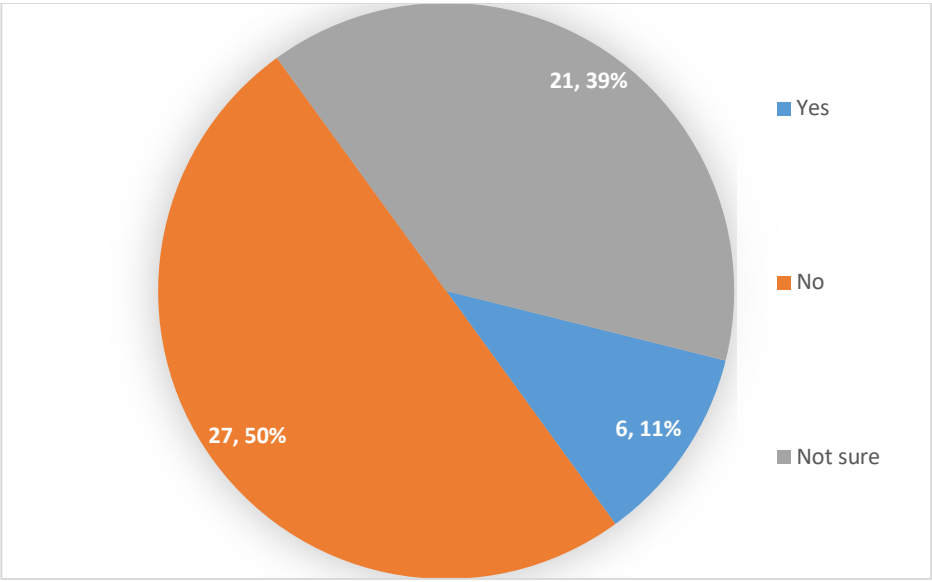

Figure 6. Awareness of RDM policy existence (n=54)

Question 8: Are you aware of any RDMS in place in the UNAM library?

The majority (34; 63%) of respondents are not aware of any RDMS that is in place in the UNAM library. The lack of awareness might be influenced by the high number of library assistants who are probably not involved in RDMS. Twenty (37%) of the respondents are aware that there is RDMS in place in the UNAM library. For those who said 'Yes' to question 9, a follow-up question was asked for them to list the RDMS they are aware of. Table 2 is a collation of their responses into categories.

Table 2. RDMS in place in the UNAM library

Answers	***Frequency***
Digitisation of thesis and dissertation	6
University repository	7
Data preservation	4
Data sharing	7
Data storage	2
Data citation	2
Data management plan	1
RDM policy development	2
Data archiving	4
Advisory services	1
Policies copyrights, open access, and research strategy	1
Accessibility to research data	2
Training	1

Question 9: Are you aware of any RDMS being developed in your library?

As shown in Figure 7, the majority of participants said that they are unaware of any RDMS being developed in their library (32; 59%). Twenty-two participants (41%) said that they are aware of the RDMS being developed in their library.

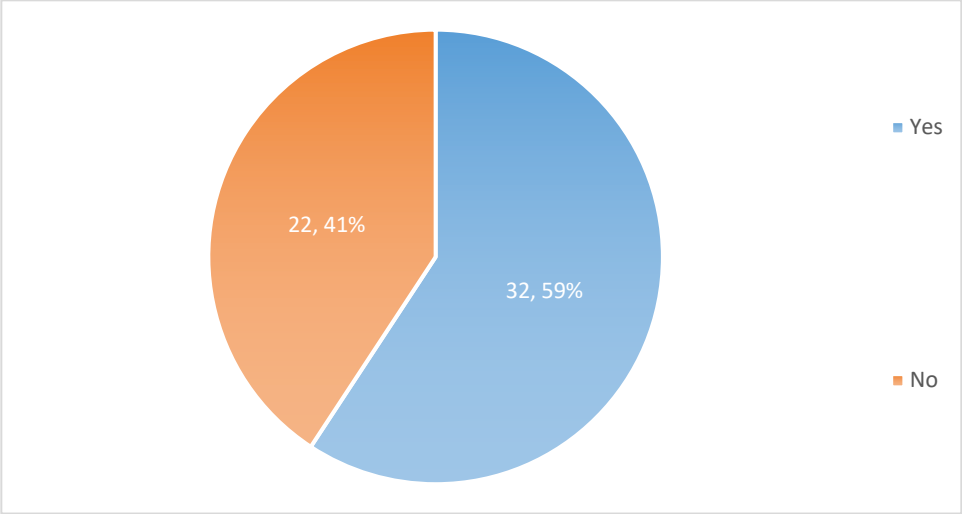

Figure 7. Awareness of RDMS being developed in the UNAM Library (n=54)

Question 10: Is there a department in your library that is responsible for (current or future) RDMS?

The results show that 31 (57%) participants said that there is a specific library department responsible for RDMS; they were asked to name this department. The most named was the Research Support Services as the responsible department. Sixteen (30%) of the participants are not sure, while 7 (13%) said that there is no department responsible for RDMS. A free text was given to respondents to name the departments responsible for RDMS and the results were quantified. Table 3 provides the results.

Table 3. Department identified as responsible for RDMS (n=31)

Answers	***Frequency***	***Percentage***
Research support services	15	48%
Technical department	4	13%
User services	2	6%
Archive department	1	
ICT department	1	
Research innovation	1	
Library and scholarly communication support services unit	2	
Repository	2	
Still under process	1	
There is a librarian responsible for research services	1	

Question 11: Who in the library has the primary leadership responsibility for plans and programmes related to RDMS?

Thirty-four (72%) of the participants selected the head of research support as the primary leader responsible for plans and programmes for RDMS. Seven (15%) selected the scholarly communication librarian as the responsible person. In the 'Other' category, participants (13%) provided different answers ranging from the university librarian to an indication that they were not sure.

Question 12: Which specific skills do you think are needed to offer RDMS?

Figure 8 presents what UNAM library staff consider to be the specific skills needed to offer RDMS. Participants could select multiple answers. Metadata (40; 76%) and digitising skills (40; 76%) are

considered as the most needed. Other skills are represented as follows: data preservation skills at (38; 72%), data storage skills at (37; 70%), and ICT skills at (35; 66%).

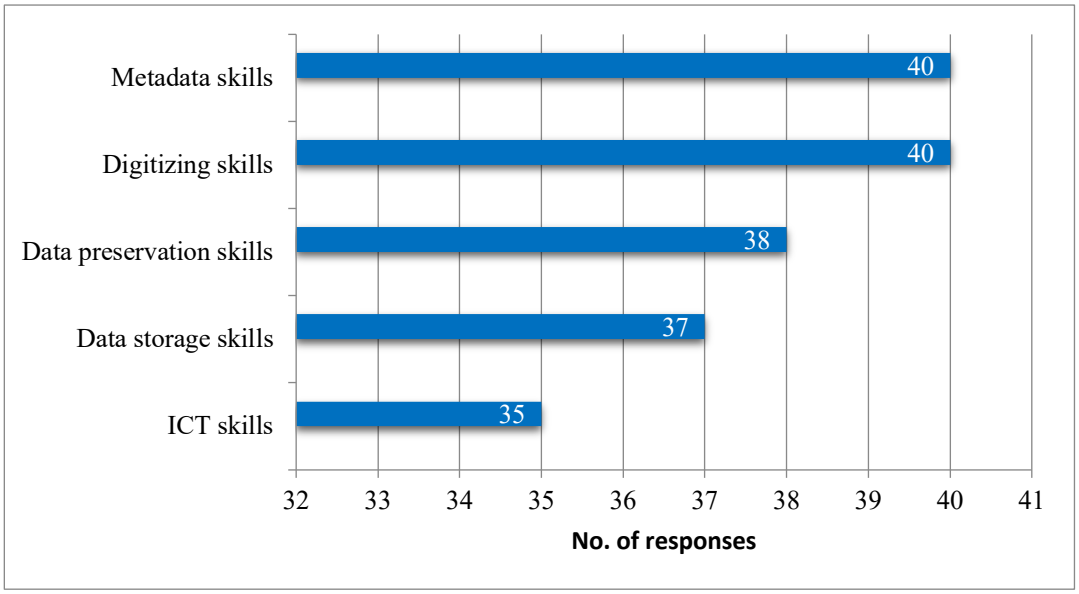

Figure 8: RDM skills considered to be needed to offer RDMS (n=54)

Question 13: Are you aware of the importance of RDMS?

The researcher was interested in determining whether participants were aware of the significance of RDMS. Participants provided multiple responses when asked to elaborate on their response, so the percentage exceeded 100 %. The majority of participants believe that RDMS facilitates access to research data (15; 33%) respectively, followed by data preservation, research support, data reuse, data retrieval and data storage as important, as shown on Table 4.

Table 4. The importance of RDMS (n=46)

Answers	***Frequency***	***Percentage***
Helps with accessibility to research data	15	33%
To support research	10	22%
Data preservation	11	24%
Data reuse	7	15%
Retrieval of data	4	9%
Data storage	5	11%
Contributes to policy development	2	5%
Preventing duplication	1	2%
Data security	1	2%
Not sure	7	15%

Question 14: Are there staff development opportunities for RDMS at UNAM?

The majority (39; 75%) of the participants believe that there are no staff development opportunities for RMS at UNAM, while 13 (25%) think that there are.

A follow-up question was posed to those who said 'Yes' for them to list the development opportunities. All respondents to this question revealed that UNAM has a staff development programme to support staff members. One of the respondents stated that it is the individual responsibility of staff members to develop their skills in librarianship. Another respondent mentioned that *"Library Management encourages and supports staff to pursue studies in the area of Research and Scholarly Communications, Digital Curation and other recent topics trending in the field of Library and Information Studies"*.

Question 15: What skills do you currently have that could contribute to RDMS at your library?

The majority lack RDM skills (9; 20%). Eight (18%) have metadata and preservation skills that could help the UNAM library's RDMS. Some respondents (7; 16%) believe that they have ICT skills that can

aid RDMS at the UNAM library. Five (11%) of the respondents mentioned data sharing abilities. Table 5 shows that only a small number of respondents have skills in the following categories: data organisation, data security, data management planning, data archiving, and data security.

Table 5. RDMS skills (n=44)

Answers	***Frequency***	***Percentage***
Don't have RDMS skills	9	20%
Metadata skills	8	18%
Preservation skills	8	18%
ICT skills	7	16%
Data sharing skills	5	11%
Data storage skills	2	5%
Data organising skills	2	5%
Data archiving	2	5%
Data mining	1	2%
Data security	1	2%
DMP	1	2%

Question 16: In which of the following areas would you feel confident offering RDMS?

Participants were instructed to tick as many answers as applied. As shown in Figure 9, data sharing (38; 73%) was selected as the area participants feel confident offering services in. Nineteen (37%) feel confident in data management planning, followed by metadata services (17: 33%) and data preservation (15; 29%). Only 11 (21%) were respectively selected for data archiving and citation. The 'Other' category revealed that one respondent felt confident in policy development.

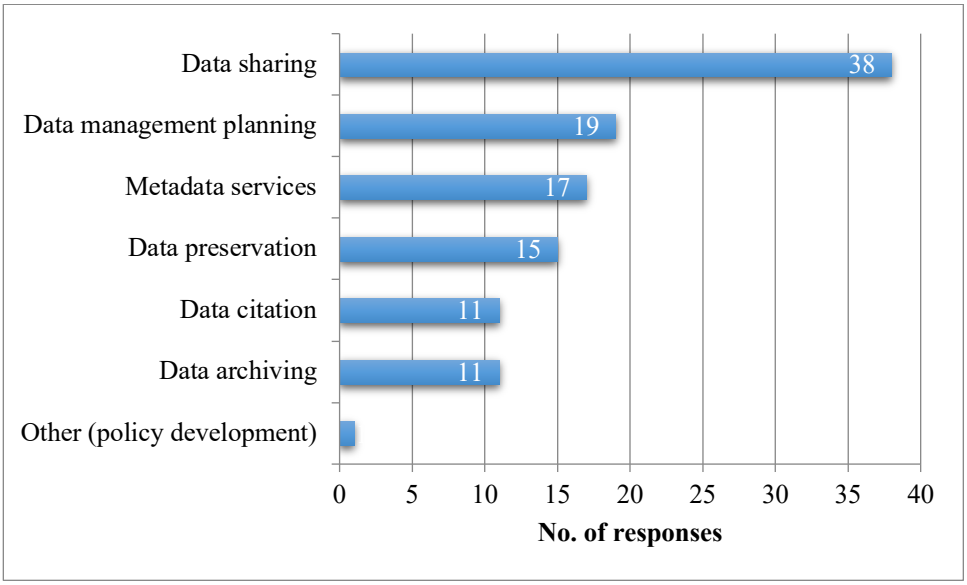

Figure 9. Areas participants feel confident offering RDMS (n=52)

Question 17: In which of the following areas do you feel you need additional training/development opportunities?

Participants were instructed to tick as many answers as applied. The majority of participants feels that they need additional training on data management planning (37; 71%). Thirty-two (32; 62%) were correspondingly recorded on metadata services and data archiving, and nearly 60% felt the need for training on data preservation. Figure 10 further illustrates that participants felt that they need training in data citation (30; 58%) and data sharing (15; 29%).

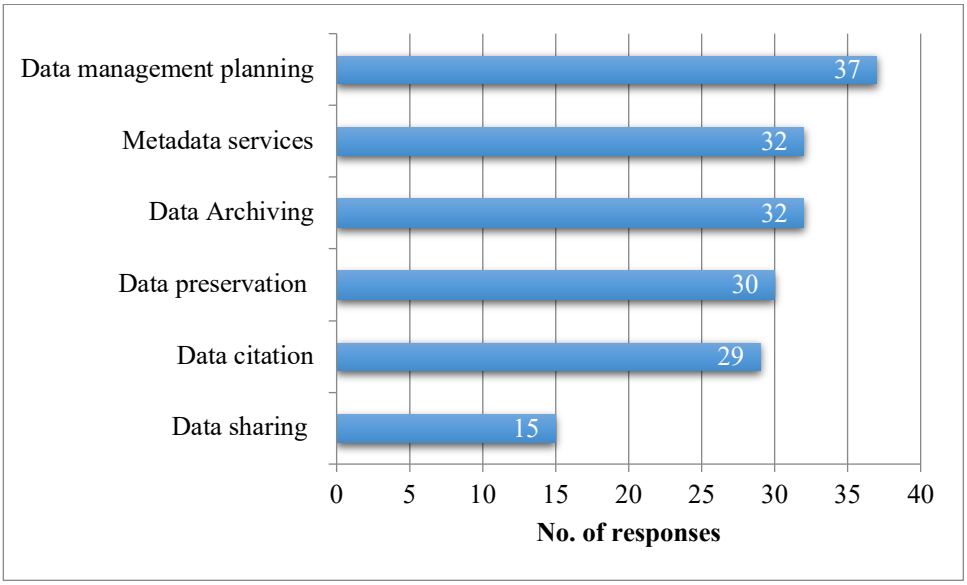

Figure 10. Areas participants feel they need additional training (n=52)

Question 18: How has your library developed staff capacity and capability for RDMS?

Table 6 lists the ways the library has developed staff and capability for RDMS. It appears that the majority feels that the library does not offer RDMS training and others are unaware of whether UNAM has developed staff capacity and capability for RDMS. Table 6 details free-text responses that were quantified.

Table 6. Staff capacity and capability for RDMS (n=37)

Answers	***Frequency***	***Percentage***
To attend a further study on RDM	5	14%
In-house training (e.g. adding thesis, articles on the repository, data sharing)	5	14%
The library does not offer training	10	27%
Self-learning	6	16%
Not sure	8	22%

Question 19: Do you think that research support staff at UNAM have the required skills to operationalise/ manage research data effectively?

A slight majority of participants (25; 51%) believes that research support staff lack the necessary skills to effectively operationalise/manage research data, though 24 (49%) believes that they do not have the necessary skills.

When asked to elaborate on their responses, one respondent stated that there is only one library staff with a qualification in digital curation; some respondents felt that they are capable because they are qualified and knowledgeable while others stated that they are not because "they need the training to keep up with current practices and ICT tools and software".

Question 20: Which skills do you think are missing for you to operationalise RDMS in the library?

The majority of the participants think that the following are skills missing to operationalise RDMS: data preservation skills, data management planning skills, data archiving skills and data citation skills. A small number mentioned the following skills areas: data sharing, human resource, infrastructure, ICT, and metadata as shown in Table 7.

Table 7. Skills needed to operationalise RDMS (n=40)

Answers	***Frequency***	***Percentage***
Data preservation skills	10	25%
Data citation skills	5	13%
Data management planning skills	9	23%
Data archiving skills	6	15%
IT skills	2	
Metadata skills	2	
Data sharing skills	2	
Infrastructure	1	
Human resource	1	
Digital curation	2	

Question 21: What is the library currently capable of doing in terms of offering RDMS?

UNAM staff believes that the library is capable of offering RDMS related to data sharing, data preservation, and data archiving through the UNAM institutional repository. Other RDMS they believe the library is capable of include digitisation and data storage as shown in Table 8.

Table 8. RDMS that staff feel the library is capable of offering (n=33)

Answers	***Frequency***	***Percentage (%)***
Data sharing	11	33%
Data preservation	5	15%
Data archiving	7	21 %
Digitisation	6	18%
Data storage	3	9%
Metadata	1	

B.2 Beliefs about the capabilities of librarians regarding RDMS at UNAM

The following questions are posed in relation to the research objective of identifying the staff attitudes that affect the operationalising of RDMS at UNAM.

Question 22: Given the current status of your library, do you personally feel that you and/or your library are ready to offer RDMS?

Figure 11 indicates that the majority (28; 57%) of the participants believes that their library is ready to offer RDMS, while 21 (43%) believe that the library is not ready to offer RDMS. Those who responded 'no' to question 23 were asked to state the reasons. Lack of qualified data librarians was mentioned by ten respondents, and three of the respondents mentioned lack of training among other responses, including lack of budget and infrastructure. On the other hand, one respondent believes that UNAM library has the infrastructure and diverse skills among librarians to offer RDM.

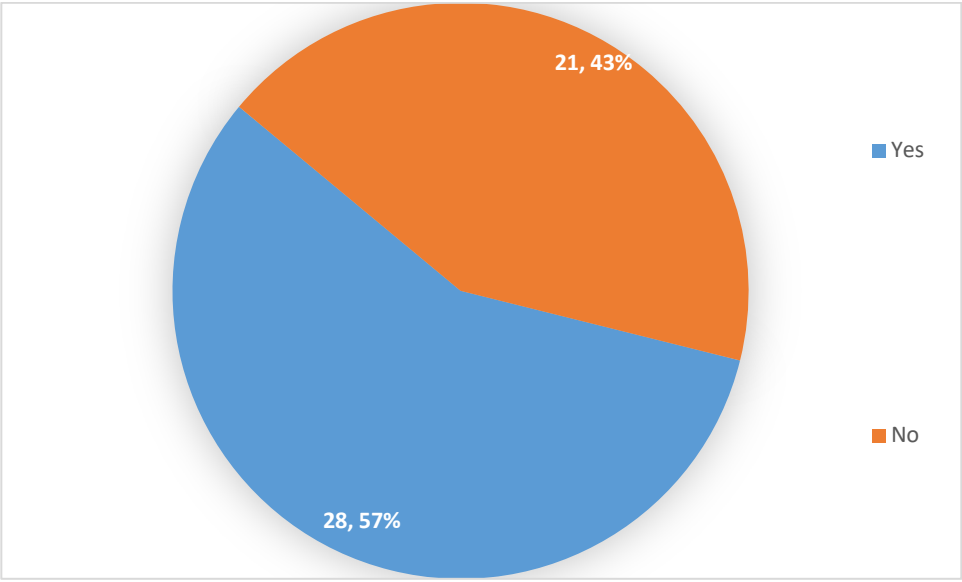

Figure 11. Readiness according to staff to offer RDMS (n=49)

Question 23: Do you think that RDMS will benefit UNAM staff and students?

Overall, the majority (42; 84%) of the participants feel that RDMS will benefit UNAM staff and students and 8 (16%) believes that it will not. Two participants are unsure. Participants were asked to elaborate on their responses. One participant stated that RDMS is important because "RDMS will

benefit UNAM staff and students by allowing research data to be re-used, promote research collaboration, validate research and avoid duplication".

Among other reasons for managing data is to ensure that data is retrieved, preserved, and shared and improving the visibility of research data. Three of the participants feel that RDMS will save time and resources. Ten of the participants cited that RDMS will provide easier access to research data. Additionally, two participants feel that it will provide library statistics on the usage of research data in the library.

Question 24: Do you believe that the library is the right place to offer RDMS?

The responses to this question show that 39 (81%) identified that the library is the right place to offer RDMS, 7 (15%) of the respondents are not sure if the library is the right place to offer RDMS, and a relatively small number (2) indicated that the library is not the right place to offer RDMS, as shown in Figure 12.

Of the participants who elaborated on their answer to Question 25, the majority stated that the library has the infrastructure (for example, repositories) to offer RDMS, and some of the participants believe that the library has staff who possess skills such as preservation and metadata skills. One participant does not think that the library is the right place to offer RDMS, but nevertheless shared the view that *"we have few people who understand RDM and few infrastructures such as repositories"*.

Some of the participants mentioned 'Yes' to question 25 and stated that the library is responsible for housing research data at the university. However, one participant mentioned that *"not entirely because there is also a research department independent from the library"*. The participant was referring to the department of research and innovation which is overseeing research at UNAM.

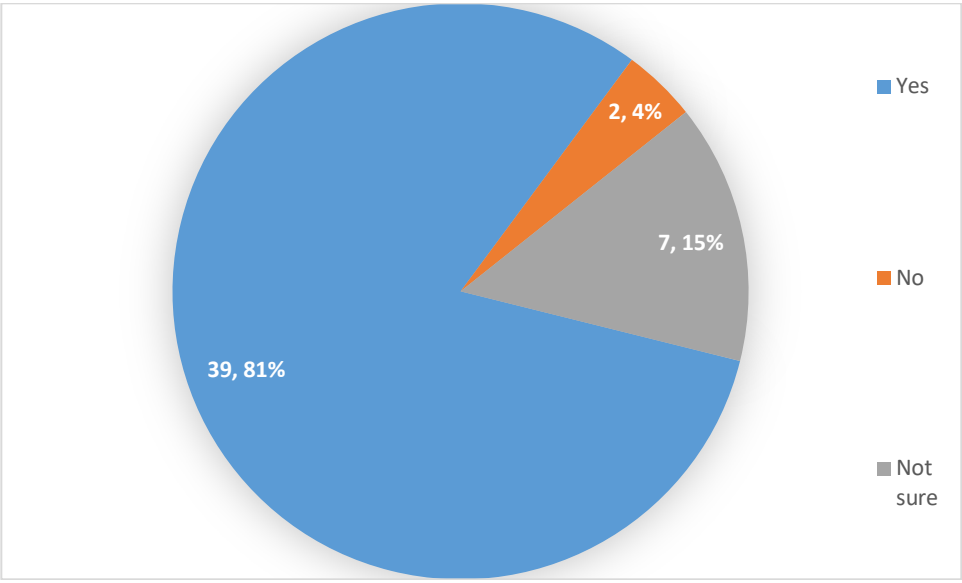

Figure 12. The library being the right place to offer RDMS (n=48)

B.3 Environmental factors and resources affecting the development of skills and abilities to offer RDMS at UNAM

Questions under this section were asked in relation to the environmental factors that affect the development of skills and abilities to offer RDMS at UNAM.

Question 25: Does your institution have a dedicated budget for RDMS skills development?

As shown in Figure 13, the majority (29; 57%) are not sure whether there is a dedicated budget for RDMS skills development. Just two said there was one, but 20 (39%) said there was not.

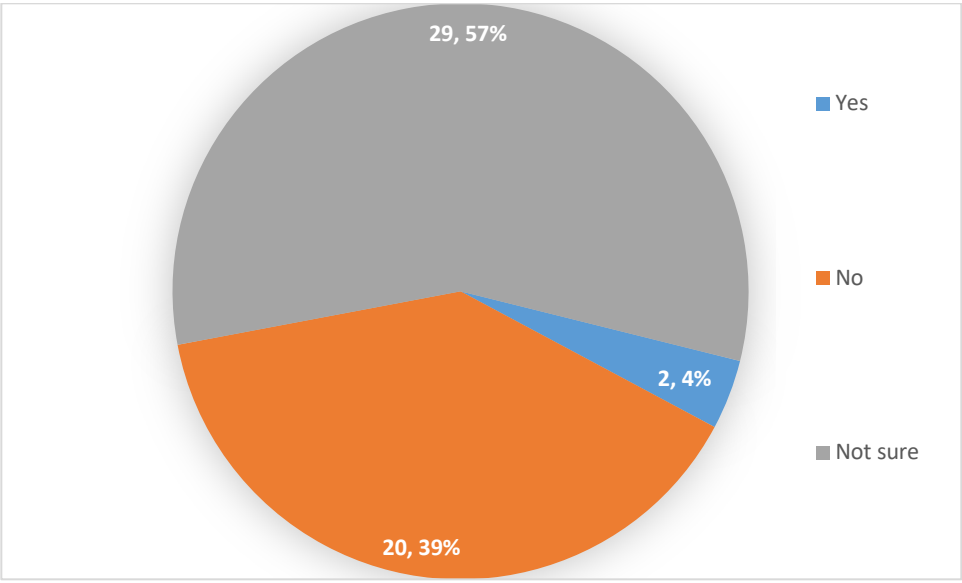

Figure 13. Dedicate budget for RDMS skills development (n=51)

Question 26: What resource challenges does your library face in offering RDMS?

It is apparent that the library faces several challenges concerning offering RDMS. Table 9 reveals that lack of financial resources (13; 33), lack of human capital (9; 22.5%) and lack of infrastructure (7; 17.5%) are considered as the major challenges.

Table 9. Resource challenges your library faces in offering RDMS (n=40)

Answers	***Frequency***	***Percentage***
Lack of financial resources	13	33%
Lack of human capital	9	23%
Lack of infrastructure (i.e. ICT)	7	18%
Not sure	11	28%
Not prioritised	1	

Question 27: Do (or will) the libraries collaborate with any other departments/units/ divisions/people within the university to offer RDMS?

Figure 14 demonstrates that the majority (27; 54%) are not sure about collaboration, though 20 (40%) stated that the UNAM library will collaborate with other departments. Only 3 (6%) said that it will not

collaborate with other departments. When elaborating on their answers, five of the respondents mentioned that the library will collaborate with the IT department, and another five of the respondents stated that it will collaborate with the Department of Research and Innovation. Among other responses included that collaboration happened with academic faculties, schools and departments, and with the finance and examination departments.

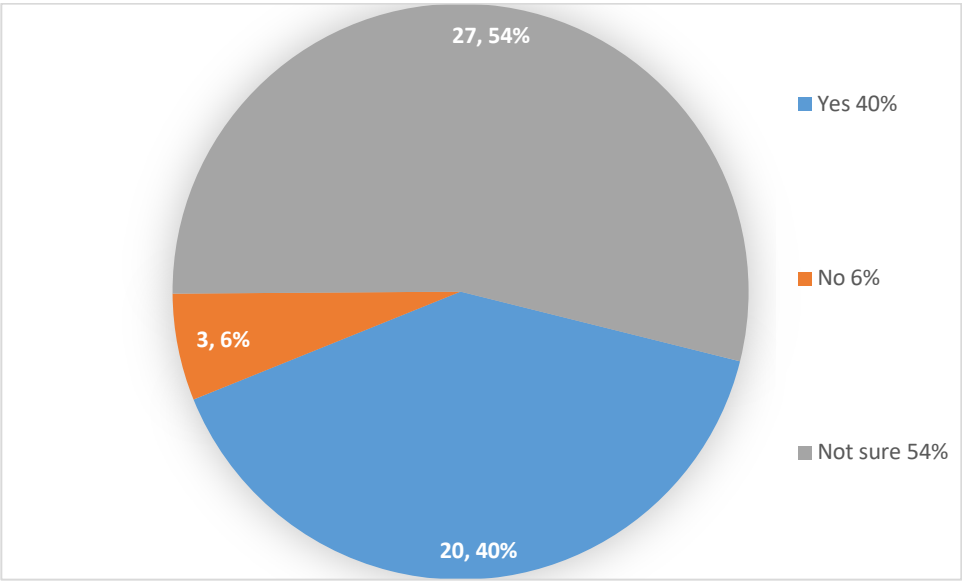

Figure 14. Library collaboration with other departments (n=50)

Question 28: Has your library undertaken any changes in organisational structure with the introduction of RDMS?

Figure 15 reveals that 20 (40%) of the participants indicated that the library has undertaken changes in organisational structure with the introduction of RDMS. Eighteen (36%) of the participants are not sure whether the library has undertaken changes in organisational structure with the introduction of RDMS. Nearly a quarter (12; 24%) of the participants mentioned that the library has not undertaken changes in organisational structure with the introduction of RDMS. A free text for elaboration revealed the following responses: establishing a research services department and appointing a research librarian/scholarly communication librarian were the changes undertaken in the organisation to support the introduction of RDMS.

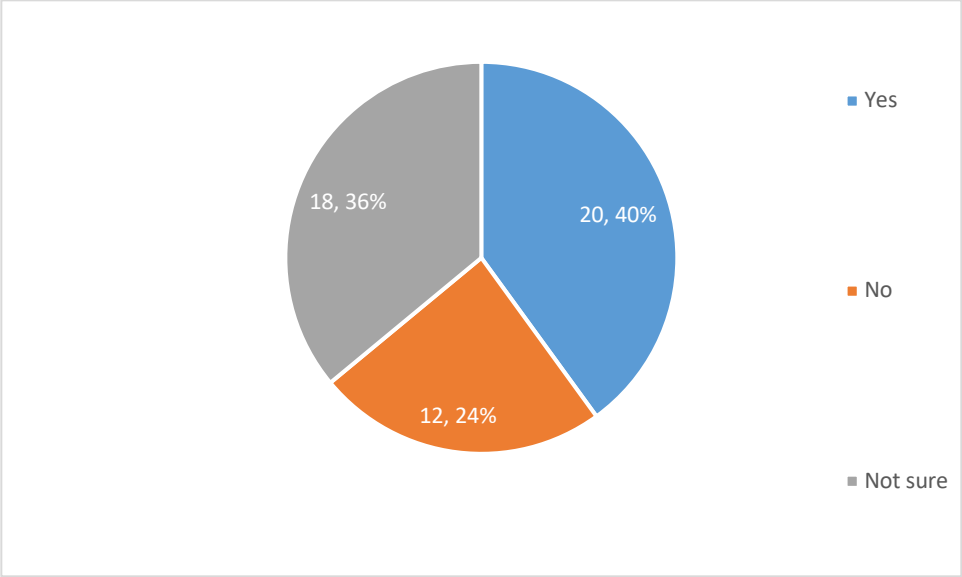

Figure 15. Changes in organisational structure (n=50)

Question 29: Which of the following staff development opportunities related to RDMS has your library provided?

Figure 16 demonstrates the staff development opportunities related to RDMS that the UNAM library has provided. Respondents could select multiple answers. Data sharing was regarded as the most offered staff development opportunity that the UNAM library has provided, followed by data archiving and closely followed by data preservation and metadata services. The least selected were data citation and data management planning which were selected below 20%.

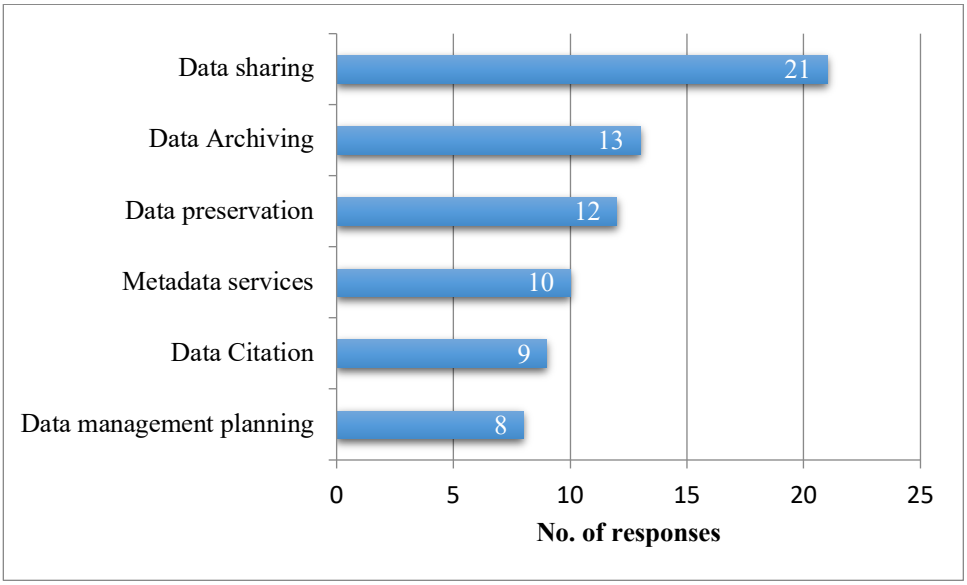

Figure 16. Staff development opportunities related to RDMS (n=45)

Question 30: Have there been any additional opportunities for the staff to develop skills related to RDMS?

As shown in Figure 17, the majority (22; 43%) of participants are not sure. Nineteen out of 51 of the participants said no, while 10 (20%) said yes that there had been additional opportunities for the staff to develop skills related to RDMS.

An additional question was posed to identify what additional opportunities are and whether respondents have taken advantage of them. Ten responses were received and one of the participants mentioned that *"I was trained on depositing and access to research data on the UNAM repository"*.

Others attended online training seminars, others through studies, and one participant stated through workshops, conferences and peer learning.

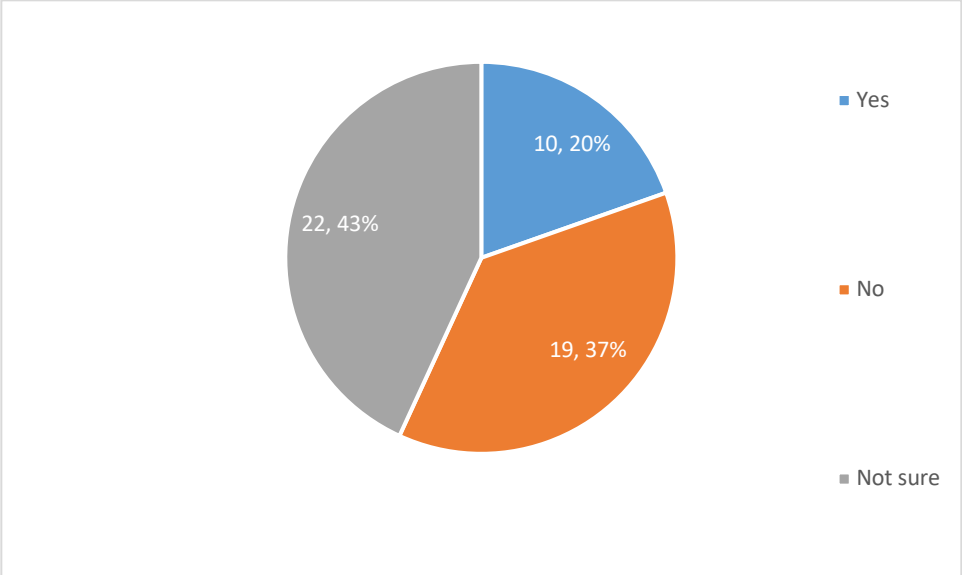

Figure17. Opportunities for the staff to develop skills related to RDMS (n=51)

B.4 Social influences that affect the operationalising of RDMS at UNAM

The following questions were posed to identify the social influences that affect the operationalising of RDMS at UNAM.

Question 31: What do you think were the reasons for initiating RDMS at UNAM?

Table 10 lists the reasons that participants gave for the initiation of RDMS at UNAM. The study reveals that the most common reasons include data preservation (7; 29%) and institutional mandate (5; 21%). Three responses (13%) were recorded in the following categories: To provide access to data; conform to international good RDMS standards, data sharing and data storage. Interestingly, 11 out of 41 participants are not sure of the reasons for initiating RDMS at UNAM. A free text was given to elaborate on their responses and responses were quantified.

Table 10. Reasons for initiating RDMS at UNAM (n=41)

Answers	***Frequency***	***Percentage***
To provide access to data	3	7%
To preserve data	7	17%
Institutional mandate (i.e. Research and Innovation)	5	12%
Conform to international good RDMS standards	3	7%
For data sharing	3	7%
Data storage	3	7%
Data security	1	
Research discoverability	1	
Better research funding	1	
Research impact	1	

Question 32: Is the library considered to be the entity responsible for RDMS?

Out of 44 responses, 17 of the participants stated that the library is considered to be the entity responsible for RDMS due to the availability of the infrastructure for handling RDMS such as the institutional repository. Moreover, the library has a department for research support services. Seven of the participants revealed that they are not sure.

Question 33: At what level in the organisation is the person primarily responsible for RDMS?

Table 11 indicates that the majority (25; 57%) stated that the senior librarian is the person primarily responsible for RDMS. Six (14%) specified that the head of the department is the person primarily responsible for RDMS. Five (11%) of the respondents are not sure as to what level in the organisation is the person primarily responsible for RDMS.

Table 11. Level of the person in the organisation primarily responsible for RDMS (n=44)

Answers	***Frequency***	***Percentage***
Senior librarian	25	57%
Head of the department	6	14%
Librarian	5	11%
Senior library assistant	3	7%
Not sure	5	11%

Question 34: Please feel free to comment below on anything else you would like to share on operationalising RDMS at UNAM

This open-ended question was aimed at finding participants' thoughts on the operationalising of RDMS at UNAM. Participants recognised the importance of RDMS, but the feeling was that, to fully operationalise RDMS, UNAM management needs to recognise how vital these services are. The following were the comments:

- Lack of knowledge, skills and training were identified as the challenges. For example, one respondent revealed that *"more training is required on RDM", "Support from the management", and "Librarians need to upskill and attend courses on Digital curation"*. One respondent mentioned that librarians need to embrace RDMS. Another respondent revealed that most UNAM staff members do not understand what RDM entails. This highlights the need to provide training on RDMS among UNAM library staff members.
- RDMS is not fully operationalised, however, there is awareness of the importance of RDMS
- RDMS is a "*trend in academic libraries and should be prioritised both at work and school of information science as a subject/course"*.
- *"RDMS should be at each library, especially Academic libraries, to enhance the quality of handling, dissemination and distribution of data"*.
- For the UNAM library to be compared to other libraries, UNAM must prioritise supporting the RSS department to operationalise RDMS.
- RMDS should be implemented across the UNAM campuses.

- RDMS is "*important and we should all embrace it in order to make research data accessible"*. Furthermore, for RDMS to be fully implemented and operationalised, UNAM management needs to recognise its importance.
- RDMS is "*a new service at UNAM. Staff are busy developing a policy and guidelines to offer the best RDM services to users"*.

4.3. Qualitative phase

This section presents data collected through a focus group discussion with five purposively selected UNAM library staff. The interview was conducted with the Senior Librarian Scholarly Communication, Senior Librarian Research Support Services, Senior Librarian Systems, Digital Curator Librarian, and Assistant Librarian (Special Collections).

The interview questions that were put across to the participants are in Appendix B. Participants are referred to as P1, P2, P3, P4 and P5.

As mentioned in Chapter Three, in an explanatory mixed methods design, a qualitative approach is used to 'explain' quantitative results. Thus, for this study, the focus group was used to shed light on some of the quantitative data in order to answer the research questions of the study.

4.3.1. Knowledge of librarians to provide effective RDMS at UNAM

The quantitative data showed that the majority of UNAM staff know what RDM is. However, as a group, they were uncertain about whether the library had a formal RDM policy. All interviewees confirmed that there is no formal RDM policy at UNAM. P1 and P3 stressed that the RDM policy is still in a draft format.

Concerning the RDMS currently in place in the UNAM library, of which the majority of questionnaire respondents were not aware, interviewees mentioned the university repository, and that the library provides mostly *ad hoc* RDMS like advice on data plans, digitisation, repository, for example. Interviewees concurred that some RDM activities like data sharing, data storage and data citation were happening at the individual researcher level and informally.

Quantitative data showed that staff are divided in their awareness of whether RDMS are being developed in the library. P2 stated that a Research Electronic Data Capture (REDCap)[1] platform was being developed which would support researchers in collecting and storing their data during their research, though not later. P5 sees REDcap as an important starting point for introducing RDM activities to the UNAM community. P1 and P4 stressed that the library was still at the RDMS planning stage. Though not a service, policy development was considered by P1 to be one current initiative of importance.

Quantitative data showed that the majority thought that the department that is responsible for RDMS is the research support services department. P2 stated that there is no one department that is responsible for RDMS. For example, P1 emphasised that within the institution, there were various entities which supported research (such as Postgraduate Centre, IT, and Research Centre) but that the library is the initiator of the [RDM] services. In agreement, P5 said *"the library takes the lead"* in the institution when it comes to RDMS. P3 agreed that within the library, all departments have RDMS responsibility.

The question on the primary leadership responsible for RDMS plans and programmes elicited mixed responses. P1, P2 and P3 mentioned that RDMS were a collaboration between the UNAM library and the Centre for Research Services. However, P4 and P5 believe that the research support librarian and scholarly communication librarian under user services have the primary leadership responsibility for RDMS plans and programmes. P5 explained that research support and scholarly communication under user services will be responsible for the RDMS plans and programmes.

The quantitative data revealed that the majority of respondents indicated that there are no RDMS staff developments opportunities offered by UNAM. All interviewees stated that UNAM provides staff opportunities to study but deciding which course to study is at an individual level. In terms of in-house development opportunities, P5 mentioned training and mentoring among colleagues in the library.

4.3.2. Librarian skills to adopt and provide RDMS at UNAM

The quantitative data revealed that the majority of the participants do not have RDMS skills that can contribute to RDMS at the library. About the specific skills needed by academic librarians to provide RDMS in the library, interview participants felt that the following skills are important as a contribution

[1] REDcap is a secure web-based application used to support data capture for research studies.

to RDMS at the library: data analysis, data protection skills, sharing skills, research skills, data archiving ICT skills, preservation skills, and database skills.

The quantitative data (Q17, Q18) indicated that there is a need for RDM skills training among UNAM library staff. The interview explored what RDMS training is offered, to which staff and how they would find out about it.

P1 mentioned that some training is outsourced, for example, the training offered by Elsevier on certification RDM, specifically, P5 affirmed that there is training on REDcap, while P2 mentioned scholarly communication training which would include *"the aspect of research data management to sensitize our colleagues"*. P4 mentioned online in-house training so that librarians from other campuses can attend. Interview participants concurred that training opportunities are always shared through emails.

Considering the current skills level of UNAM librarians to offer RDMS, all participants highlighted that there is a gap in the skills level of UNAM librarians to offer RDMS and that upskilling is needed. The library has one RDM expert (digital curator) but one respondent said that, *"I have enrolled in a free online course on RDM, but I feel that most of our colleagues are hesitant to do the same in order to advance our skills because it is something we need to consider"* (P1). Short courses were given as examples of how librarians could upskill themselves. P5 expressed the need to conduct a skills gap analysis among the role players on RDMS. P4 was vocal about the collegiality among UNAM library staff in terms of sharing knowledge and skills: *"this is a real plus!"*

4.3.3. Academic librarians' beliefs about their capabilities regarding RDMS

The quantitative data revealed that the majority of respondents seem to have a positive attitude towards RDMS being offered in the library.

Similarly, the interviewees highlighted that librarians have a positive attitude towards RDMS, using phrases like *"there is no resistance because the interest is already there"* (P1), and *"there is new development on RDMS such as the introduction of the research support services, and the appointment of the digital curator and scholarly communications librarian"*. (P2) said that *"those that I have interacted with within the library, they have shown a strong passion for RDMS because they even call us specialised librarians. [There is] an excitement for me that when they refer to you as a specialized*

librarian it means they really want to see what we are doing, where we are heading and want to see [us] succeed" (P4). P1 communicated that librarians who are interested will help with the implementation of RDMS.

4.3.4. Environmental context and resources that affect the development of skills, abilities, and adaptive behaviour on RDMS at UNAM

The quantitative data revealed that the majority of respondents mentioned that there is insufficient infrastructure and resources to implement RDMS at the UNAM library.

P1 expressed that there was still a lot to be done in terms of infrastructure (with which P4 agreed) because *"we do not have a research data management platform to actually store and share data, and there is no preservation infrastructure"*. In contrast, P2 thinks that the infrastructure is there, as evidenced by the availability of REDcap and the current server capacity of the university. P2 however indicated that *"we just need to work together to discuss with management because we need support from them. If we don't get support from management I am not sure if we can do much"*. The respondent believes that if the university is currently providing online activities, this can provide RDMS. Another respondent affirmed that infrastructure development requires attention despite rolling out the REDcap.

The following data analysis is from the second session of the focus group discussion to which only P1, P2 and P4 were able to attend.

The quantitative data revealed that the majority of respondents indicated that UNAM has no budget for RDMS skills development. While P4 is not aware of any budget for RDMS skills development, P1 and P2 clarified that while there is no dedicated budget for RDMS skills development (the economy was cited as a reason), conference attendance and short courses can be planned for in advance.

The quantitative data revealed that the majority of respondents were not sure about collaborations with other departments and units, therefore the researcher wanted to find out if there were indeed no collaborations.

According to the participants (and as raised earlier), there is collaboration with the Research Centre, Postgraduate Unit, and ICT department. UNAM Press was named additionally in relation to the Digital Object Identifier (DOIs). P4 further felt that *"there are many other sections that will get involved when it comes to research data management; it's not going to be a one person show"*.

All interviewees agreed that RDMS in the library is developing into a strong service within the library organisation. The respondent explained that the library has the expertise needed to offer RDMS and that it has taken the initiative by creating positions such as a digital curator. P1 also stressed the fact that RDMS is part of the library's strategic plan. P2 said that a "strong library team working together with the strong leadership we have and [with] the strong support from the stakeholders" would result in a strong service. P4 highlighted that the library's traditional strengths such as collection development, metadata, and training skills, would form a solid base for RDMS.

P1 felt that the economic crisis as previously mentioned is hindering opportunities for professional development in RDMS. P4 related environmental factors to the issue of individuals not knowing how to manage their data "especially when using the terminology RDM. However, once well explained, then you will find out that they are actually doing it. All that is needed is to do an awareness programme to sensitise them".

4.3.5. Social influences that affect the operationalising of RDMS at UNAM

Quantitative data did not shed enough light on the social factors that influence and inhibit UNAM from initiating RDMS.

P 1 alluded that, *"I think that a quality assurance study as well as library trends influenced UNAM to initiate RDMS"*. Both P1 and P4 cited informal conversations with and among researchers as influencing the introduction of RDMS. Journals are also factors, as are funders.

P1 told this story:

"I remember one of the researchers was scratching his head because there was an international organisation that was interested in using his research data for a publication published with Elsevier. Unfortunately, he did not have anything to provide, not even the questionnaire nor the raw data so it is those social issues that have actually informed the library's decision that we have to embark on research data management. So that's what actually activated the desire to implement such services. So yes, they were those social factors and also with interaction with different researchers in informal platforms may be you get a researcher asking you to see if you will be able to locate their questionnaire that they have used when they have done their masters, their PhD at a time when there were no online repositories."

P4 recalled:

"When it comes to social influence, it's that people randomly speak about research data management with the people that they are close to. I, for example, had an interesting conversation with one of the UNAM graduated who graduated a long time ago and was asking me suddenly am looking for the data I collected. That's when I brought in why they have to keep their data for future use or something like that and I was giving the person examples that would you believe that I still have my undergraduate data that I collected on paper because it was a qualitative study that time that I did."

The respondent further demonstrated that social influence could happen randomly. It can be in corridors, in a formal set up and or even in a social kind of gathering like online workshops and online searches.

The quantitative data revealed that the majority of respondents considered the senior librarian to be the primary person responsible for RDMS, while others mentioned the Head of Department.

The focus group revealed that there is no single person for RDMS at UNAM. As in earlier discussions, many entities were identified, with P4 stating that, *"I don't believe there is a section in the library that actually works in [a] silo; we are actually working together"*. According to P1, some co-workers are at the forefront who are in touch/interact with the users. They conduct training, advocate for open research data, and advocate for research data management in the university workplace. P1 concluded that the responsibility lies with the university librarian and the director for research services. P2 agreed about the university librarian to services being offered. P4t, however, said the senior librarian for research.

4.3.6. Concluding question

This question was aimed at finding participants' further thoughts on operationalising RDMS at UNAM. Common issues were identified through the quantitative data, therefore, participants who are in the forefront of RDMS at UNAM had to share information on operationalising RDMS and provide any additional insights on operationalising RDMS at UNAM.

P1 reiterated the deployment of REDcap as the real first step in establishing a "baseline for research data management". However, the participant emphasised that there is a need for additional infrastructure to cater for other stages of research data management, which includes sharing and

reusing, publishing, tracking the impact of research data, and data preservation. P2 suggested focusing more on advocacy and sensitising researchers, including research staff and academic researchers so that they can understand the importance of research data management. *P2 said that it was important to provide training so that researchers and staff can understand "why we are introducing the services, why it is important, what is the benefit that they have by accessing these services".*

P4 said that they have already introduced REDcap and they are going to test the platform to receive feedback from individuals. P4 furthermore said that *"we are actually not far from realising our dream. It's just that a matter of us putting our heads together and move and I think now that we have this discussion, it's more like it is lighting up a way in a way that we are actually, I have learnt from our interaction in this interview".*

4.4. Chapter summary

This chapter presented the data that was collected. In order to have a clear understanding of the data that was collected, the researcher analysed and presented the data in graphs, charts, tables, and themes. The study further requested librarians at UNAM to give comments and views regarding operationalising RDMS at UNAM, and their comments and views were listed. The next chapter discusses the findings of the study and gives some recommendations, and also a summary and conclusion of the study.

5. DATA INTERPRETATION, RECOMMENDATIONS, AND CONCLUSIONS

5.1. Introduction

This chapter presents the findings of the study. The chapter responds to each objective by discussing the study findings under each objective. Based on the insights gained regarding the findings, the researcher gives recommendations as well as suggestions for future and further studies on the topic.

5.2. Discussion of the findings in light of the data

The findings of the study are discussed in light of the data analysis, the Theoretical Domains Framework (TDF) which was used to frame the study, and the literature.

5.2.1. Knowledge and skills of librarians to provide RDMS at UNAM (Objective 1)

This objective was addressed by looking at the knowledge and skills possessed by librarians that can contribute to operationalising RDMS at UNAM. In order for librarians to offer RDMS, there is a need for them to have the knowledge of RDM, and they need to have competencies and skills that can enable them to provide RDMS in the library. Conversely, the lack of knowledge and skills among librarians can hamper the operationalising of RDMS.

Knowledge

In TDF, knowledge is the "awareness of the existence of something" (Atkins et al., 2017:3). In the present case that relates to RDMS, knowledge in the study implies the domain to assess the knowledge of librarians including knowledge of condition, procedural knowledge and the knowledge of the task which could contribute to librarians operationalising RDMS at UNAM. In order for librarians to operationalise RDMS, knowledge serves as a motivating factor and facilitator for librarians' engagement in RDMS activities at UNAM.

The study found that the majority of participants are aware of what constitutes RDMS and they understand the importance of RDMS. However, library assistants (13%) are not aware of what RDMS entails. Following TDF, knowledge is a leading and contributing factor for librarians to provide RDMS at UNAM because knowledge influences librarians' behaviour on how well they can operationalise RDMS. Knowledge increases the staff's confidence to engage and effectively offer RDMS.

Respondents highlighted the current developments taking place at UNAM in light of RDMS by mentioning the RDMS that are being developed. RDMS referred to in the study could be metadata services, data organisation services, data deposit, data archiving, outreach and collaboration services, DMPs, and data training services which UNAM has to operationalise. They also revealed those who are at the forefront of the RDMS initiative in terms of leadership responsibility and the current staff development opportunities for RDMS being offered at the UNAM library including all policies that are still under development stages which are yet to be finalised. Therefore, this indicates that librarians are generally aware of and understand the importance of RDMS to the institution, researchers, and the students which would contribute to operationalising RDMS at UNAM. Tenopir et al. (2019) found similar results on librarian knowledge, where the majority of librarians had the knowledge to provide or develop RDMS.

The disparities in the responses among the questionnaire participants in the study could be that the participants who were assistant librarians had no knowledge about RDMS because they are not at the forefront of RDMS as their responsibilities are mainly shelving library materials.

Skills

In TDF, skills refers to the abilities or proficiencies acquired through practice (Atkins et al., 2017:3) and skills under the TDF domain includes skills, competencies, abilities and coping strategies (Atkins et al., 2017:3). These can enable librarians to effectively offer RDMS. In order for librarians to effectively provide RDMS, they need skills and competencies to operationalise and practice RDMS. Without certain skills, librarians may not be able to operationalise RDMS effectively.

The study findings revealed that there is a lack of competencies and skills among the majority of librarians who participated in the study to provide RDMS, where the majority of the participants indicated that they lacked skills in data preservation, data management planning, data archiving and data citation which are vital for the operationalising of RDMS. Cox et al. (2017) also found that a major challenge was skills development which resulted in a skills gap among librarians which called for reskilling. However, Cox and Verbaan (2012) state that librarians are well-networked to acquire the skills to effectively adopt and provide RDMS.

The consequences of librarians not having skills that can contribute towards academic libraries offering RDMS are that the operationalising of RDMS at the UNAM library may be slow which might deprive

students, researchers and funders access to research data that may be useful for creating new knowledge through research.

The specific skills and competencies required by academic librarians could be grouped as ICT skills, metadata skills, data sharing skills, data archiving skills and preservation skills which respondents highlighted to be part of the development opportunities at least offered to library staff by UNAM.

5.2.2. Librarians' attitudes regarding RDMS at UNAM (Objective 2)

TDF terms attitudes as "beliefs about capabilities", and refers to these as self-confidence, competence, self-professional confidence and beliefs influencing the behaviour change of staff members to engage and effectively offer and implement new services (Atkins et al., 2017:3), and in this case, academic librarians operationalising RDMS.

The study used the TDF domain on beliefs about capabilities to assess librarians' attitude towards RDMS, to find out if librarians were ready to offer RDMS, find out if librarians thought the library was the right place to offer RDMS, and determine the attitude of librarians on the importance of RDMS to the institution, researchers and students.

The study revealed that the majority of librarians who participated in the study had a positive attitude towards RDMS. Librarians believe that the library is the right place to offer RDMS. The librarians believe that the library is ready to offer RDMS considering the skills they already possess which could support RDMS in the library. Librarians feel that RDMS will benefit students and researchers through providing access to carefully curated data for re-use in creating new findings in studies already conducted, thereby giving an opportunity to researchers by creating new knowledge from the already existing data from different fields. Similar sentiments were echoed in Tenopir (2012), where librarians involved in RDM saw RDMS as crucial services that are as important as other activities taking place in the library. A positive attitude displayed by librarians towards RDMS is an enabler and contributing factor towards academic librarians wanting to engage and operationalising RDMS at the UNAM library. It suggests that librarians value RDMS and they are ready to engage in activities and programmes leading to the operationalisation of RDMS in the library.

5.2.3. Social and environmental factors contributing to the engagement of librarians with RDMS at UNAM (Objectives 3 and 4)

These objectives were addressed by looking at the social and environmental factors contributing to the engagement of librarians with RDMS at UNAM. The TDF domains are used as guides to assess the current infrastructure and resources, social pressures, and power dynamics available which can inhibit or contribute to librarians operationalising RDMS at UNAM.

Environmental factors

The environmental context and resources domain includes environmental stressors and environmental tasks through considering the availability of resources, infrastructure, human capital, organisational and leadership support and materials (Atkins et al., 2017:3). These can affect the operationalisation of RDMS.

The study found that the UNAM library does not have a budget that is dedicated to RDM and librarian skills development. The university does not have sufficient financial and human capital resources and proper infrastructure to support RDMS initiatives in the library. The absence of infrastructure, human capital, and resources prevent librarians from engaging fully in RDMS at UNAM. Likewise, in Chiware and Becker (2018), and Faten, Maha, and Aman (2019), several environmental factors inhibited librarians' engagement in RDMS, for example, a lack of budget, IT infrastructure and skilled personnel to assist researchers in the storage and preservation of data were reported.

Environmental factors are considered to be barriers in academic libraries operationalising RDMS in Africa of which UNAM is not an exception. Most of the barriers identified by respondents in this domain could be categorised as, absence of a dedicated budget for the development of librarians' skills and proper ICT infrastructure, human capital and financial resources which can be attributed to economic crisis both at national and international levels. This means that librarians at UNAM cannot operationalise RDMS effectively at the moment.

Social factors

Social factors in TDF are regarded as a "coherent set of behaviours and displayed personal qualities of an individual in a social or work setting" (Atkins et al., 2017:3). Social factors could be the social/professional role and identity influences within an institution as well as social influences outside the institution (Atkins et al., 2017:3) such as comparisons that UNAM makes in order to benchmark and be on the same level with other institutions. This domain was used to find out if there are some social factors that influenced UNAM library in wanting to operationalise RDMS.

The study findings revealed that factors that influenced the initiation of RDMS emanated from the need to adhere to global standards, benchmarking and the need to store data and provide accessibility to research data generated by researchers and students. Social factors that led to RDMS initiation can be referred to as the results of the research data quality study that was conducted at UNAM, library trends, and informal conversations among researchers. Funder and journal requirements, informal talks on RDMS during conferences and practicing RDMS at an individual level are some of the social factors.

Benchmarking, social and professional group identity and conforming with international standards are termed as social factors in TDF. TDF emphasises that social factors such as social identity, group norms, international standards, and organisational culture play a role and serve as driving forces for the engagement and creation of new activities and services. Knight's (2015) study on the establishment of RDMS at the School of Hygiene was a result of pressure from the faculties and academics to ensure that data is carefully managed and secured, which resulted in the introduction of RDMS. Pressure from academics and faculties are what is termed as social influence that led to the introduction of new services. Therefore, in the case of RDMS at UNAM, the pressure from researchers wanting to access their research data, informal talks from conferences and friends sharing data, for example, are the social influence factors.

5.2.4. Positive and negative issues related to librarians that affect the operationalising of RDMS at UNAM (Objective 5)

As can be seen from the previous sections, there are positive and negative issues that are related to librarians that affect the operationalisation of RDMS at UNAM. These are now summarised.

- The study found that the library does not have a budget dedicated to the development of staff skills to support RDMS. Therefore, the lack of skilled human capital and training reduces librarians' confidence in effectively offering RDMS at the UNAM library.
- The library does not have sufficient infrastructure to store and preserve research data for future use. The library only uses REDcap which is used only during the research process. TDF considers infrastructure as the main condition and environmental stressor that can lead to the implementation of new services by the staff.
- The institutional repository does not have data deposits from researchers, thereby making it difficult for the institutional repository to be used for data management storage and function as an RDMS. When the repository does not have data being deposited by researchers, this makes it difficult for librarians to provide access to research data both to the funders, the institution and students and thereby to operationalise RDMS fully.
- RDMS are being practiced at an individual level where librarians, researchers and students share data with friends, thereby making it difficult for the institution to fully operationalise RDMS because data is not shared fully.
- UNAM does not have a formal research data management policy or related policy. TDF emphasises that organisational leadership and commitment influence and drive the development and enabling of policies to help with the formalisation and implementation of new services (Atkins et al., 2017). When there are no policies in place, it becomes very difficult to implement RDMS as they will not be used optimally. Therefore, UNAM as an institution must ensure that policies are in place to mandate the management of data by postgraduate students and researchers.

5.3. Study recommendations

In light of the main findings, the following recommendations are made to operationalise RDMS at UNAM. Recommendations are made in relation to the five domains in TDF.

- In terms of knowledge, librarians are aware and understand the importance of RDMS to both the institution, researchers and students at large. However, UNAM's policy on RDM is still in a draft phase for the formalisation and operationalisation of RDMS. Therefore, the study recommends that UNAM has to finalise and implement the RDM policy. Once the policy is

finalised, UNAM must create awareness of the policy firstly to those who support research, like librarians. Creating policy awareness can potentially help UNAM and its stakeholders to understand the importance of RDMS which may influence and change the behaviours of stakeholders and librarians to operationalise RDMS at the UNAM library. Similarly, studies done on RDMS note that the implementation of the RDM policy is the first step (Patterton, Bothma & Van Deventer 2018:19). Therefore, to optimise the operationalisation of RDMS, UNAM needs to finalise, create awareness and implement an institutional RDM policy.

- The study recommends that UNAM has to collaborate with other research institutions like UCT and Cape Peninsula University of Technology, and others, that are currently operationalising RDMS well, because this will help the institution's staff to acquire the knowledge and skills leading to the operationalisation of RDMS at UNAM.

- The study recommends that to overcome the challenge of lack of skills, the UNAM library should consider providing training on RDMS. Supporting this recommendation is Chiware and Mathe (2016) who said that the UNAM library must develop a special skills development plan to enable librarians to participate in RDM. The School of Library Science at UNAM could adjust their curriculum to reflect the new and emerging roles of librarians in the emerging data driven research environment to fill up the skills gap among librarians.
- The study recommends that UNAM consider a dedicated budget and sufficient funding for infrastructure development and the recruitment of adequately skilled human capacity for operationalising RDMS. Bothma et al. (2018) point out that in order to operationalise RDMS, academic libraries need to have a budget and funding for upskilling and infrastructure setup.
- The study recommends that a relevant RDM implementation plan be instituted that can guide UNAM towards the establishment of RDMS while taking into account their limitations and restrictions concerning human resources, infrastructure and finances.
- Librarians displayed a positive attitude towards RDMS and highlighted that the library is considered to be the right place to offer RDMS, and they are ready to offer RDMS. It is encouraged that the UNAM library continuously engage other entities as this can lead to growth. This can be done through conferences, seminars and networking through engaging with others who have already implemented RDMS.

5.4. Study limitations

Du Plooy-Cilliers, Davis and Bezuidenhout (2014:275) regard limitations of a study as the obstacles that limit the study and that the researcher has no control over. The researcher is cognisant that there were several limitations to the study which include the following:

- Data for this study was collected towards the end of midterm and during the midterm break, meaning that some of the participants could not respond to the survey because they were already on holiday resulting in only 51% of those invited participating in the survey. There can be a possible low response rate; however, the researcher tried to alleviate this limitation by sending reminders to all participants and emphasising the importance of their responses.
- There was a possibility for respondents to try to please the researcher by providing answers that reflect well on them or that they think the researcher would like to hear (Du Plooy-Cilliers, Davis & Bezuidenhout, 2014:275). To mitigate this limitation, the researcher asked the participants to be as honest as possible.
- The majority of respondents to the questionnaire were library assistants. Therefore, they were not expected to be knowledgeable about RDMS. The qualitative phase of data collection adequately filled any gaps in the quantitative data. The reason why library assistants were included in the study is because the study used a census, which required all library staff to participate in the study.

Even though the study had limitations, the study still serves as a contribution to RDMS studies particularly in terms of the behaviours of librarians and the operationalisation of RDMS.

5.5. Future research studies

The study recommends the following for future studies:

- The study used a mixed methods approach. For future studies, a purely qualitative study could attain detailed information on more academic librarians' behaviours.
- Since the study only adopted five domains of the TDF, a study using other or all 14 domains could give more insights into factors that contribute to academic libraries operationalising RDMS.
- Since the study was only conducted at UNAM, a comparative study carried out at the other two Namibian universities, the Namibia University of Science and Technology (NUST), and the

International University of Management (IUM), could establish the challenges faced by these two institutions as well and consequently nationally when it comes to the operationalising of RDMS.

5.6. Chapter summary and conclusions

The study investigated the operationalisation of RDMS at UNAM in relation to knowledge and skills, beliefs about capability, social influence, and environmental context and resources to effectively provide RDMS at UNAM and the findings were discussed in alignment with the research objectives. The discussions of the study findings led to the conclusion and recommendations about the operationalisation of RDMS at UNAM, as well as areas for future studies. The theoretical domain framework (TDF) was used to guide the study's investigation into the knowledge and skills possessed by librarians to effectively provide RDMS at UNAM, the attitudes of librarians towards research RDMS, their beliefs about their capabilities in offering RDMS at UNAM and the social and environmental factors affecting librarians' engagement with RDMS.

RDMS are increasingly becoming important services offered in academic libraries. The establishment of RDMS in academic libraries is intended to ensure that there is value for the return on the investment by funders, which may lead to data being utilised in future to produce new research outcomes. Research data that is well managed is easy to discover, use and cite, which results in good research practices for institutions like UNAM where research is being conducted by researchers and postgraduate students. Therefore, operationalising RDMS in institutions like UNAM is important. Academic libraries have been identified as suitable places where RDMS can be offered due to the availability of staff members with specialised skills which could contribute towards the effective operationalising of RDMS. Academic librarians can coordinate RDM efforts outside their institution by sharing lessons learn in professional groups and building partnerships with other universities to develop and test RDM solutions.

In view of the results of the study, there are still challenges that libraries are facing which could hinder their engagement in operationalising RDMS. It is hoped, however, that this research has contributed to knowledge about these challenges, as well as highlighting the positives, that can be used to effectively operationalise RDMS at UNAM and possibly elsewhere.

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Appendices

Appendix A. Informed consent form and ethical consideration

Student Name: Ishmael Mafale

Student Number: MFLISH001

Research Topic: Operationalising research data services in academic libraries in Africa: the case of the University of Namibia

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Consent form for online questionnaire

I am requesting your participation in an online survey for my study titled, *Operationalising research data services in academic libraries in Africa: the case of University of Namibia*. My study is a minor dissertation to fulfil the requirements for a Master of Philosophy specialising in Digital Curation. The questionnaire should not take more than 30 minutes of your time.

Your participation in the study. Participation in this study is voluntary; you have the right not to participate in this study if you do not wish to do so or exit the survey at any stage without consequence. Apart from the first question that requires your response to determine if you continue or exit the survey, you are free not to answer any question if for any reason you do not wish to answer it.

Benefits for participation in the study. There are no direct benefits from participating in this study. However, your responses will help me to learn more about RDMS and help establish UNAM's position with regards to operationalising research data services, Moreover, the study will contribute to research in RDMS in academic libraries at UNAM and in Africa at large.

Risks involved. No risks are associated with participating in this study.

Confidentiality and anonymity. Your confidentiality is guaranteed as your survey responses are collected and sent to Google Drive where data will be stored and protected securely in an electronic

format. Only the researcher and his supervisor will have access to data. Additionally, the questionnaire does not collect identifying information such as your name, email or IP address. Therefore, your responses will remain anonymous. No one will be able to identify you, and no one will know whether or not you participated in the study.

Enquiries: If you have any questions regarding the survey or this research in general, contact Mr Ishmael Mafale on his cell number: +264813751010 or by email: MFLISH001@myuct.ac.za. Additionally, you can contact my supervisor Michelle Kahn on the telephone number: +27 (0) 21 650 1851 or email: michelle.kahn@uct.ac.za.

Consent: Selecting Agree below indicates that:

- You have read the above information
- And that the above information is clear and understood
- Your participation is voluntarily
- You are above the age of 18 years
- Do you consent to participate in the survey?

- Agree [will take the participant to the first page of the survey].
- Disagree [will exit the survey].

Appendix B: Data gathering instrument (Questionnaire).

SECTION A

This section will collect data about the characteristics of the population under study. Please select the most suitable answer and elaborate where relevant.

1. What is your occupation?

- University Librarian
- Deputy University Librarian
- Head of Department
- Subject Librarian
- ICT Librarian
- Archivist
- Assistant Archivist
- Assistant Librarian
- Senior Library Assistant
- Library Assistant
- Administrative and support staff
- Other (please specify) …….

2. What is your highest qualification?

- Certificate
- Diploma
- Bachelor's degree
- Master's degree
- PhD
- Other (please specify) …….

3. In which department do you work?

- Management (excl. Heads of Departments)
- User Services
- Technical Services
- Archives and Special Collections
- Systems

4. On which campus are you based?

- Windhoek (main campus)
- Khomasdal campus
- Southern campus
- Ogongo campus
- Neudam campus
- Oshakati campus
- Rundu campus
- Sam Nujoma campus
- Hage Geingob campus
- Hifikepunye Pohamba
- Katima Mulilo
- Jose Eduardo Dos Santos campus

5. For how long have been working in the UNAM Library?

- Less than 5 years
- 5-10 years
- 11-15 years
- 16-20 years
- More than 20 years

SECTION B

Please answer the following questions about your knowledge, skills, beliefs about capabilities, environmental context and resources, and social influences related to RDMS at UNAM. Please select the most suitable answer and elaborate where relevant.

B.1 Knowledge and **skills of librarians regarding RDMS at UNAM**

6. What is your understanding of research data management (RDM)?

   ……
   ……

7. Does your library have a formal RDM policy in place?

- o Yes
- o No
- o Not sure

8. Are you aware of any RDMS in place in UNAM library? If yes, please list them.

- o Yes
- o No

   ……
   ……

9. Are you aware of any RDMS being developed in your library?

- o Yes
- o No

10. Is there a department in your library that is responsible for RDMS (current or future)?

- o Yes
- o No
- o Not sure

If yes, please name it

……

……

11. Who in the library has primary leadership responsibility for plans and programs of RDMS?

- o University Librarian
- o Deputy University Librarian
- o Head Research Support Services
- o Other (please elaborate)

……

……

12. Which specific skills do you think are needed to offer RDMS?

- o ICT skills
- o Data storage skills
- o Data preservation skills
- o Digitising skills
- o Metadata skills
- o Other (please elaborate)

……

……

13. Are you aware of the importance of RDMS? Please elaborate.

……

……

14. Are there staff development opportunities for RDMS at UNAM? If yes, please explain your answer.

- o Yes
- o No

.....

.....

15. What skills do you currently have that could contribute to RDMS at your library?

……

……

16. In which of the following areas would you feel confident offering RDMS?

- Data Archiving
- Data Citation
- Metadata services
- Data preservation
- Data management planning
- Data sharing
- Other (please elaborate)

……

……

17. In which of the areas do you feel you need additional training/development opportunities?

- Data Archiving
- Data Citation
- Metadata services
- Data preservation
- Data management planning
- Data sharing
- Other (please elaborate)

……

……

18. How has your library developed staff capacity and capability for RDMS?

……

……

19. Do you think that research support staff at UNAM have the required skills to operationalise/ manage research data effectively? If yes, please explain.

- Yes
- No

……

……

20. Which skills do you think are missing for you to operationalise RDMS in the library?

……

……

21. What is the library currently capable of doing in terms of offering RDMS?

……

……

B.2 Beliefs about capabilities of librarians regarding RDMS at UNAM

22. Given the current status of your library, do you personally feel that you and/or your library is ready to offer RDMS? If you answer is no, please state your reasons for your answer.

- Yes
- No

……

……

23. Do you think that RDMS will benefit UNAM staff and students? Please elaborate

- Yes
- No
- Not sure

……

……

24. Do you believe that the library is the right place to offer RDMS? Please explain your answer.

- o Yes
- o No
- o Not sure

……

……

B.3 Environmental factors and resources affecting the development of skills and abilities to offer RDMS at UNAM

25. Does your institution have a dedicated budget for RDMS skills development?

- o Yes
- o No
- o Not sure

26. What resource challenges does your library face in offering RDMS?

……

……

27. Does (or will) the library collaborate with any other departments/units/divisions/people within the university to offer RDMS? Please elaborate on your response.

- o Yes
- o No
- o Not sure

……

……

28. Has your library undertaken any changes in organisational structure with the introduction of RDMS? If yes, please elaborate

- Yes
- No
- Not sure

……

……

29. Which of the following staff development opportunities related to RDMS has your library provided?

- Data archiving
- Data citation
- Metadata services
- Data preservation
- Data management planning
- Data training
- Data sharing
- Other (please elaborate)

……

……

30. Have there been any additional opportunities for the staff to develop skills related to RDMS? If yes, please indicate what they are and whether you have taken advantage of them.

- Yes
- No
- Not sure

……

……

B.4 Social influences that affect the operationalizing of RDMS at UNAM

31. What do you think were the reasons for initiating RDMS at UNAM?

……

……

32. Is the library considered to be the entity responsible for RDMS? Please elaborate.

- Yes
- No
- Not sure

……

……

33. At what level in the organisation is the person primarily responsible for RDMS?

- Head of Department
- Senior Librarian
- Librarian
- Assistant Librarian
- Senior Library Assistant
- Library Assistant
- Administrative support staff
- Other (please elaborate)

……

……

34. Please feel free to comment below on anything else you would like to share on operationalising RDMS at UNAM.

Thank you for participating in this study

Appendix C: Data gathering instrument (Interview schedule).

Interview guide

Thank you for participating in this interview, the questions were posed to provide more detail about some of the results in the questionnaire. Please elaborate wherever possible on the questions that I pose to you.

1. **Knowledge of librarians to provide effective RDMS at UNAM**

1.1 Can you confirm that there is a formal RDMS policy at UNAM?

1.2 Are there any RDMS currently in place in the UNAM library?

1.3 If yes do your RDMS include the following?

- Digitization of thesis and dissertation
- University repository
- Data preservation
- Data sharing
- Data storage
- Data citation
- Data management plan
- RDM policy development
- Data archiving
- Advisory services
- Policies copyrights, open access, and research strategy
- Accessibility to research data
- Training

1.4 Are there any RDMS being developed in your library?

1.5 What is the name of the department that is responsible for (current or future) RDMS in the library?

1.6 Can you confirm who in the library has primary leadership responsibility for plans and programs related to RDMS?

1.7 Which staff development opportunities for RDMS does UNAM offer?

2. **Librarian skills to adopt and provide RDMS at UNAM**

2.1 What are the specific skills needed by academic librarians to provide RDMS in your library?

2.2 What training is offered by unam library to staffs in line with RDMS and to whom is it offered, and how do they know about the training?

2.3 What are your thoughts regarding current skills level of UNAM librarians to offer RMDMS?

2.4 Most of the librarians seems to have positive attitude towards RDMS being offered in the library, is this the impression you have of staff's attitudes in general?

3. Academic librarians' beliefs about their capabilities regarding RDMS

3.1 Most of the librarians seems to have positive attitude towards RDMS being offered in the library, is this the impression you have of staff's attitudes in general?

4. Environmental context and resources that affect development of skills, abilities, and adaptive behavior on RDMS at UNAM

4.1 Do you think that the current infrastructure and resources of the UNAM library are sufficient to implement RDMS and develop the necessary skills and abilities of librarians to offer these services? Please elaborate

4.2 Can you confirm whether there is a dedicated budget for RDMS skills development?

4.3 Are the any possibilities of collaborating with other departments/units/divisions/people within the university to offer RDMS?

4.4 Is RDMS in the library allowed to develop into a strong service within the library organization? Please elaborate.

4.5 Have there been environmental issues related to skills development for staffs to develop their skills in line with RDMS?

5. Social influences that affect the operationalizing of RDMS at UNAM

5.1 Were there any social factor that influenced UNAM to initiate RDMS?

5.2 Who is the person primarily responsible for RDMS at UNAM?

5.3 At what level is this person at UNAM?

6. Concluding Question

6.1 Do you have any other information you can provide regarding operationalizing research data management services at UNAM libraries?

THANK YOU

Appendix D: Ethical clearance UCT

Department of Knowledge and Information Stewardship

Faculty of
Humanities
University of Cape
TownUpper
Campus

Private Bag X1, RONDEBOSCH, 7701 South
Africa Level 6 Hlanganani, The Chancellor
Oppenheimer LibraryTel: +27 (0) 21 650 4546
E-mail:
dkis@uct.ac.za
Internet:
www.dkis.uct.ac.za

UCTDKIS202203-01 17 March 2022

Ishmael Mafale

Department of Knowledge and Information

StewardshipUniversity of Cape Town

Dear Ishmael Mafale

I am pleased to inform you that ethical clearance has been granted by the Ethics Review Committeeof the Department of Knowledge and Information Stewardship on behalf of the Humanities Facultyof the University of Cape Town for your Master of Philosophy specialising in Digital Curation studyentitled: *Operationalising research data services in academic libraries in Africa: the case of the University of Namibia.*

I wish you the very best with your study.

Yours sincerely,

Andiswa Mfengu

Chair, Department (DKIS) Research Ethics Committee

"Our Mission is to be an outstanding teaching and research university, educating for life and addressing the challenges facing our society."

Appendix E: Permission letter to conduct study at the university of Namibia (UNAM).

CENTRE FOR RESEARCH SERVICES
Office of the Pro-Vice Chancellor: Research Innovation and Development
UNIVERSITY OF NAMIBIA, Private Bag, 13301 Windhoek, Namibia
340 Mandume Ndemufayo Avenue, Pioneers Park, Office D090 ☎ +264-61-2064624 kmbulu@unam.na Fax+264-61-206 4624

23 March 2022

Dear Mr. Ishmael Mafale,

PERMISSION TO CONDUCT RESEARCH ACTIVITIES AT THE UNIVERSITY OF NAMIBIA (UNAM)

Your application to conduct research at UNAM entitled: "**Operationalising research data services in academic libraries in Africa: the case of the University of Namibia**" was considered based on ethical approval from your institution. Hence, permission is hereby granted with the following conditions:

1. During the course of your research activities at UNAM, you will observe the required procedures, norms and ethical conduct in accordance with the relevant Research Policies and Guidelines. If unsure, please consult *the Centre for Research Services* at UNAM for guidance. The assessment take note of your adjusted methodology of collecting data and anonymity of participants as indicated in the email. Any deviations and amendments to the original documents submitted (i.e. methodology, interview guide, consent forms, etc.) must be submitted again for approval, before the research activities can commence.
2. The results of the findings will be shared with the PVC: Research, Innovation and Development, and the Centre for Research Services, before they are disseminated or published in the public domain.
3. Upon completion, a copy of the Research Report must be lodged with the UNAM Library for our records.
4. Proper, full acknowledgements of the University of Namibia and all participants /respondents shall be done in the Research Report and any subsequent publications arising from this research.
5. Although permission is granted, provision of information is to the consent of respondents.

If you are agreeable to the above conditions, please sign and date a copy of this letter and return it the Centre for Research Services (Email: nkanime@unam.na). If you have any queries, do not hesitate to contact the Centre for Research Services.

Wishing you all the best with your

CENTRE FOR RESEARCH SERVICES
Office of the Director
2022 -03- 23
University of Namibia
UNAM

Yours sincerely

Prof Nelago Indongo
Director: Centre for Research Services

I accept and agree to all the conditions

ISHMAEL MAFALE — Full Name and Surname

Signature

23/03/2022 — Date