

Research Data Management in Selected Universities in South Africa

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DECLARATION

"I Nambitha Manqola with student number 46289631, declare that "**Research data management in Selected Universities in South Africa**" is my work and that all the sources that I have used or quoted have been indicated and acknowledged by means using references." I further declare that I submitted the dissertation to originality-checking software and that it falls within the accepted requirements for originality.

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

Signed:  _____ Date: 30 November 2022

DEDICATION

This work is dedicated to the Manqola family, especially, my parents Thabo and Nomthandazo Manqola. My beloved daughter, Lunathi, thank you for the love, patience and understanding that you have given me throughout my studies. God bless you all.

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Thank you all and stay blessed.

ABSTRACT

Research Data Management (RDM) is an innovative trend that is growing exponentially, and globally influences the research arena, as well as academic institutions. However, the recipient of this ground-breaking research data management did not receive the same popularity as its predecessor, Open Access (OA). However, through the mandate of the National Research Foundation (NRF), slowly but surely, it is taking its position in the society of the research arena. Many academic institutions are flocking to deploy innovation time.

The ultimate aim of this study was to explore how research data management in selected Universities in South Africa, is organised. It also aimed to establish the impact that the marketing of RDM services has on academic institutions in sustaining the visibility of research data management in an academic institution.

The investigation adopted a predominantly quantitative motive approach. The targeted population was 20 and the focus was more on the personnel such as research data managers, research data supporting staff, ICTL and the marketing team of the library who are the RDM service providers of the designated institutions. The researcher used self-developed structured questionnaires that consist of both closed and open-end questions using Google Forms. The link and backup Ms-Word questionnaire were distributed to the identified population.

The researcher reviewed the study's findings considering the study's aims. The findings were reviewed considering the pertinent literature review and the work of other researchers. The findings in this study evidently demonstrate the significance of establishing proper RDM services in selected Universities and marketing in various institutions. There are different strategies that are used by the institutions in marketing the RDM to the targeted users. Furthermore, different policies that support the functionality of the RDM are in place as one of the driving factors in the implementation of the RDM. The findings of the study further correlate with the literature on the role played by the ICT support service in enhancing the functionality and sustainability of the RDM services in academic institutions in selected universities in South Africa.

Keywords: Research Data Management, Marketing strategies, South African Universities, Policies, Research Data

UMXHOLO

Ulawulo lweeNkcukacha zoPhando (RDM) yindlela entsha ekhula ngokukhawuleza, kwaye kwihlabathi jikelele inefuthe kwibala lophando, kunye namaziko emfundo. Nangona kunjalo, umamkeli wolu lawulo lwedatha yophando oluqhekezayo akazange afumane ukuthandwa okufanayo njengokwandulelayo, i-Open Access (OA). Nangona kunjalo, ngomyalelo weNational Research Foundation (NRF), ngokucothayo kodwa ngokuqinisekileyo, ithatha indawo yayo kuluntu lwebala lophando. Amaziko emfundo amaninzi athontelana ukuza kuhambisa ixesha lokuqamba izinto ezintsha.

Eyona njongo yolu phononongo yayikukuphonononga indlela ulawulo lwedatha yophando kwiiYunivesithi ezikhethiweyo eMzantsi Afrika, olucwangciswa ngayo. Ikwajolise ekusekeni impembelelo yokuthengiswa kweenkonzo ze-RDM kumaziko emfundo ekuzinziseni ukubonakala kolawulo lwedatha yophando kwiziko lemfundo.

Uphando lwamkele indlela yenjongo yobungakanani. Abemi ekujoliswe kubo yayingama-20 kwaye ingqwalasela yayingakumbi kubasebenzi abafana nabaphathi bedatha yophando, idatha yophando lwabasebenzi abaxhasayo, i-ICTL kunye neqela lentengiso yethala leencwadi elingababoneleli ngeenkonzo ze-RDM kumaziko atyunjiweyo. Umphandi usebenzise iikhweshine eziziphuhlisileyo ezakhiweyo ezibandakanya zombini ezivaliweyo kunye nemibuzo evulekileyo esebenzisa iiFom zikaGoogle. Ikhonkco kunye nekhweshine ye-Ms-Word egciniweyo yasasazwa kubantu abachongiweyo.

Umphandi uphonononge iziphumo zophononongo ethathela ingqalelo iinjongo zophononongo. Iziphumo zaphononongwa ngokuqwalasela uphononongo loncwadi olufanelekileyo kunye nomsebenzi wabanye abaphandi. Iziphumo zolu phando zibonisa ngokucacileyo ukubaluleka kokuseka iinkonzo ezifanelekileyo ze-RDM kwiiYunivesithi ezikhethiweyo kunye nentengiso kumaziko ohlukeneyo. Kukho izicwangciso ezahlukeneyo ezisetyenziswa ngamaziko ekuthengiseni i-RDM kubasebenzisi ekujoliswe kubo. Ngaphaya koko, imigaqo-nkqubo eyahlukeneyo exhasa ukusebenza kwe-RDM ikhona njengenywe yezinto eziqhubayo ekuphunyezweni kwe-RDM. Iziphumo zophando zihambelana ngakumbi noncwadi olungendima edlalwa yinkonzo yenkxaso ye-ICT ekwandiseni ukusebenza nozinzo lweenkonzo ze-RDM kumaziko emfundo kwiiyunivesithi ezikhethiweyo eMzantsi Afrika.

Amagama angundoqo: Ulawulo lweeNkcukacha zoPhando, izicwangciso zokuThengisa, iiYunivesithi zaseMzantsi Afrika, imigaqo-nkqubo, iDatha yoPhando

TS'ELISO

Research Data Management (RDM) ke mokhoa oa boiqapelo o ntseng o hola ka sekahla, 'me lefatšeng ka bophara o susumetsa lebala la lipatlisiso, hammoho le litsi tsa thuto. Leha ho le joalo, moamoheli oa taolo ena ea data ea bohlokoahali ea lipatlisiso ha a ka a fumana botumo bo tšoanang le ba pele ho eona, Open Access (OA). Leha ho le joalo, ka taelo ea Motheo oa Naha oa Lipatlisiso (NRF), butle-butle, e ntse e nka boemo ba eona sechabeng sa lebala la lipatlisiso. Litsi tse ngata tsa thuto li khobokana ho sebelisa nako ea boqapi.

Maikaelelo a magolo a thutopatlisiso e e ne e le go sekaseka ka fa tsamaiso ya tshedimosetso ya patlisiso mo Diyunibesithing tse di tlhophilweng mo Aforika Borwa, e rulagantsweng ka teng. E ne e boetse e rerile ho theha phello eo ho bapatsa ha litšebeletso tsa RDM ho nang le eona ho litsi tsa thuto bakeng sa ho boloka ponahalo ea taolo ea data ea lipatlisiso setsing sa thuto.

Patlisiso e ile ea amohela mokhoa oa sepheo sa bongata. Palo e neng e reretsoe batho e ne e le 20 'me ho ne ho tsepamisitsoe maikutlo haholo ho basebetsi ba kang baokameli ba lintlha tsa lipatlisiso, basebetsi ba tšehetsang lintlha tsa lipatlisiso, ICTL le sehlopha sa papatso sa laeaborari bao e leng bafani ba litšebeletso tsa RDM ba litsi tse khethiloeng. Mofuputsi o sebelisitse lipotso tse iketselitseng tse hlophisitsoeng tse nang le lipotso tse koetsoeng le tse bulehileng li sebelisa Google Forms. Lihokelo le lethathamo la lipotso tsa bekapo tsa Ms-Word li ile tsa abeloa batho ba khethiloeng.

Mofuputsi o hlahlobile liphuputso tsa phuputso a shebile merero ea thuto. Liphuputso li ile tsa hlahlojoa ho shebiloeng tlhahlobo ea lingoliloeng tse amehang le mosebetsi oa bafuputsi ba bang. Liphuputso thutong ena li bonts'a bohlokoa ba ho theha litšebeletso tse nepahetseng tsa RDM Liunivesithing tse khethiloeng le ho bapatsa litsing tse fapaneng. Ho na le maano a fapaneng a sebelisoang ke litsi ho bapatsa RDM ho basebelisi ba shebiloeng. Ho feta moo, maano a fapaneng a ts'ehetsang ts'ebetso ea RDM a teng e le e 'ngoe ea lintlha tse susumetsang ts'ebetsong ea RDM. Dikutollo

tša phuputšo di tswela pele ho tsamaellana le dingolwa tše mabapi le karolo e kgathilweng ke tshebeletšo ya tshehetšo ya ICT ho ntlafatseng tshebetšo le botsitšo ba ditshebeletšo tša RDM ditheong tša thuto diyunibesithing tše kgethilweng tša Aforika Borwa.

Mantsoe a bohlokoa: Taolo ea Boitsebiso ba Lipatlisiso, Maano a Papatšo, Liunivesithi tša Afrika Boroa, Maano, Boitsebiso ba Lipatlisiso

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LIST OF ABBREVIATIONS AND ACRONYMS

NRF- National Research Foundation

DMP- Data Management Plan

RDM- Research Data Management

RD- Research Data

ICT- Information and Communication Technology

IR- Institutional Repository

LIS- Library and Information Studies

OA- Open Access

ACRL- Association of College and Research Libraries

UCT- University of Cape Town

UJ- University of Johannesburg

WITS- University of Witwatersrand

UP- University of Pretoria

UNISA- University of South Africa

CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.1 Introduction and background of the study

The topic of Research Data Management (RDM) is well documented in the records by different authors (Cox & Pinfield 2014:301). The capacity at which the exploration records were created, because of expansion in the technological creation, poses a necessity for the administration of Research Data (RD) (Cox & Pinfield 2014:299). The academic library is actively involved in the researcher's journey when it comes to research project by assisting not just with facilities but with the stewarding and preservation of the knowledge created as well as broadly discoverable globally. This sentiment is supported by Perrier, Blondal and MacDonald (2018:173) by stating that academic institutions' libraries play a part in research data management (RDM), given these enlarged duties, they have had various degrees of success developing RDM support and services.

The outcomes of funding research bodies, such as the National Research Foundation (NRF), made a call to all Universities upon realisation of the value added by the raw data being lost or misplaced. Based on that sentiment, therefore, data should be readily reachable to the community and at the same time endorse the need to manage research data (Tenopir, Sandusky, Allard & Birch 2014:84). The outcomes of funding research bodies, such as the National Research Foundation (NRF), made a call to all Universities upon realisation of the value added by the raw data being lost or misplaced. Based on that sentiment, therefore, data should be readily reachable to the community and at the same time endorse the need to manage research data (Tenopir, Sandusky, Allard & Birch 2014:84).

Supporting of the data exploration output should be put in an ascribed open access repository with a Digital Object Identifier (DOI) for the prospect of citation and accessibility to the public (NRF, 2015 online 10 July 2020). This mandate has led many institutions to start strategizing on how to meet and support the requirements, set out by the NRF. With the NRF requirements encouraged stakeholders community to formulate detailed Open Access (OA) policies for its funded research; establishment of Open Access repositories and supporting public access of the repositories through

web search, retrieval according to the international standards and best practices. (NRF, 2015 online 10 July 2020).

Based on this perspective the influential schema of RDM at the organisational hierarchy level, institutions attempted to work out ways of managing support in advocacy and structure for the storage, training, and curation, to meet the needs of their research community (Cox & Pinfield 2014:300). It is expected that the academic libraries should naturally embrace the role and take the lead in supporting the RDM in their respective institutions. Many authors highlighted that those educational libraries conventionally have the capacity in affording access to intellectual information in various ways, thus it is not surprising that the managing of exploration data is a universal concern for institutional libraries (Chiwara & Mathe, 2015; Cox & Pinfield, 2014; Tenopir, Dalton, Allard, Frame, Pjesivac, Birch, Pollock & Dorsett, 2015).

1.2 Problem statement

The capacity at which RD formed, is based on the progression in the technological revolution that generates the necessity aimed at the administration of exploration records, as well as sharing and the reuse of the data (Cox & Pinfield 2014:299). Libraries have played a proactive role in marketing their services and this has become the basis for which mapping the institution's output, through utilising RDM services, becomes essential (Tripathi, Shukla & Sonker 2017:417). However, the RDM did not receive the same popularity as its predecessor Open Access(OA) even though libraries embarked on embracing the newly defined adventure. Surkis and Read (2015:7) identified several challenges confronting research institutions concerning RDM, and amongst them are the deficiency of guidelines on good practice (policy) and advocacy, insufficient human resources, technological obsolescence, and insecure structures.

Many institutions incorporated their policies on their libguides, and the question is, does those policies fully addresses and secure the participation of their stakeholder (researchers, PhD). In addition, Cox and Pinfield asserts that (2014:300) libraries have conventionally commenced with raising awareness and training events in numerous capacities, as well as about RDM. Kamara (2017:7) emphasises marketing strategies to help structure promotional events of products and services. The lack of visibility and marketing new services in academic institution, results in not knowing the service and

it being underutilised. The visibility of RDM services on the university website is important and, in some institutions, (like WITS libguides) is hidden within many tabs, to such an extent that the service can easily get lost while trying to locate the service offered. Likewise, some of the institutions' library website does not offer full information that can assist the user to be independent. Many institutions stipulated their targeted clientele on their policy documentations and their guides. Therefore, any library services need to be marketed to target the relevant audience, such as researchers, postgraduates and students (both Masters and PhD), as these patrons add more value to the institution through the output of the research data they produce. Policies and advocacy of RDM are the main drivers of the visibility, and marketing of the services is crucial. Technical infrastructure as well, plays crucial a part in upholding standards, enhancing access, as well as ensuring the best employment of RDM service to the academic institution, whilst making sure access to resources is seamlessly smooth (Schirrwagen, Cimiano, Ayer, Pietsch, Wiljes, Vompras, & Pieper, 2019:2).

The recognition is the impact that the marketing of RDM has on academic institutions to sustain the visibility of RDM and adding value in mapping the academic institution's output. South African academic institutions are becoming more involved in RDM, and it is necessary to create awareness of the services. According to Tenopir et al. (2015:325), the library staff plays a critical role in raising promotions and encouraging targeted users to participate in RDM services, as well as training sessions. In some of the institutions, the staff complement in RDM services is posing a challenge in service delivery. As the demand of this nature increases, the institutions therefore need to add more staff complement and upskill other library staff with RDM skills.

1.3 Aim of the study

The central goal of this exploration was to highlight how research data management in selected Universities in South Africa is organised. This would help proffer marketing strategies that could help academic institutions to enhance RDM services, such as in fulfilling community users' information needs. The study also aims to uncover the unpopularity of the RDM in selected universities in South Africa. To what extent the marketing strategies impacts towards the functionality of RDM services.

1.4 Objectives of the study

The following research objectives were used to guide the study:

1. Examine the types of RD in the selected Universities in South Africa.
2. Determine if the various types of RD in the selected Universities in South Africa are available.
3. Examine if the available types of RD in the selected Universities in South Africa are accessible.
4. Explore ICTs that could assist in managing RD in the selected Universities in South Africa
5. Compare strategies that could sustain the selected Universities in South Africa, regarding marketing RDM.
6. Determine policies that could support RDM in the selected Universities in South Africa.

1.5 Research questions

The succeeding queries assisted the researcher in identifying the current state of RDM's existence and marketing strategies used.

1. Is RD services publicly accessible in selected Universities?
2. How is RD in the various South African Universities managed?
3. What is the ICT's role in assisting the Universities in South Africa in managing RD?
4. What strategies are implemented to determine the effectiveness of RDM in the selected Universities?
5. Are there any marketing strategies used in the selected Universities to sustain RDM services?
6. Which policies are in place to support RDM in the selected Universities?

1.6 Conceptual framework

Despite all the challenges faced by institutions, numerous authors acknowledge libraries for resuming the RDM agenda without reluctance. Lewis (2011:13) acknowledges the need for academic libraries in educating cognizance of the trials of data management in their organisations and initiating a dialogue about it in different

ways. Lewis (2010:11) predicts a pyramid model of nine regions of RDM's motion for libraries. The study adopted the model presented by Lewis in the completion of the investigation. Lewis's pyramid assisted the researcher with an analysis of the study and gave guidance on the study. The analysis of each level gave a clear indication of the key role players of RDM in the University library. The summarized Lewis's pyramid with an in-depth explanation of each step in the pyramid:

- Develop library workforce data confidence: Problems with the RDM workforce is to educate general levels of awareness that prevail academic library staff concerning both e-research and data management matters.
- Provide researcher data advice: Academic organisations might not the have suitable ability to provide internal data management for digital datasets. While university libraries can begin offering guidance on data management to investigators, both casually and through the expansion of official content on the organisation's websites.
- Develop researcher data awareness: Providing instruction to different teams or investigators - there is a crucial part for institutional libraries in promoting awareness of the challenges of data managing within their organisations and commencing a dialogue about it through a variety of channels.
- Teach data literacy to postgraduate research students: Academic libraries to participate in exploration training conducted formally, exploration training programmes and via less formal ways to cover RDM events.
- Bring data into undergraduate research-based learning: Numerous junior scholar programmes include a thesis prerequisite that gives scholars familiarity with the generation. This is a chance to begin with the development of the best conduct among those who have an interest in exploring careers.
- Develop local data curation capacity: Both advocacy and exploration funder policies influence investigators' behaviour once libraries devote themselves in authentic data storage and curation capacity. Accumulative and numerous incident studies are accessible to assist with proper choices by the library and institutional and managers, and various Institutional Repositories (IRs) begin to make data curation a priority.
- Identify required data skills with LIS schools: Prevailing library staff play an important role towards implementing RD curation on the strategic plans of the

organisation. Also, libraries with sustained IRs are expected to need to further skills to provide significant curation of data ability locally.

- Lead on local data policy: Familiar contacts with investigators and other exploration stakeholders, discussed previously, represent a chance for the institution's implementation of the best policy leadership at the University level. University research and invention committees and senior management teams need to realise the nature of the data management challenge and the advantage of a logical approach across the organisation.
- Influence national data policy: Major performers, such as Librarians should be considered during the development of policy arenas for RD's existence Lewis (2010:11).

1.7 Institutional context

It is the University's obligation to implement initiatives and policies that would enrich them to raise the bar of their research profile. Each institution recognises that emerging and promoting innovative exploration is how the institution can stay applicable in assisting policymaking, as well as contributing towards the mandate as set out by the NRF: the funder. In attaining this, each institution needs to understand its current status-quo, regarding institutional practices, capacity, abilities and readiness to support effective and sustainable RDM services. Besides, Chiware and Mathe (2015:3) support the notion by stating that the key role of the pro-activity of the efficiency in RDM services, is a supportive structure in the academic institution.

Yet each institution needs to take into consideration the focus of addressing the opportunities and challenges posed by deploying effective RDM services. Kahn, Higgs, Davidson and Jones (2014:298) emphasise the importance of the infrastructure and its support when it comes to the deployment of RDM in supporting the institutional mission and objectives, as well as the aims of the academic institution. Libraries comply with the strategic plan of the institution by creating the platform to engage with the implementation of RDM. The importance of management of RD creates many forms. Through the emerging of the RDM institutional research data policies are developing, RDM infrastructures are being set up, librarians are being retrained to assist researchers with data deposits and preservation, and funding agencies are

requiring complex data planning and the storage and preservation of RDM in reliable institutional repositories by funded researchers (Chiware and Mathe 2015:5).

The extensive range of possible RD amenities that libraries must deal with, stretches from assisting academics to tracing resources about data managing planning or metadata standards in their disciplines to the design and preservation of full digital data repositories (Tenopir, Talja, Horstmann, Late, Hughes, Pollock, Schmidt, Baird, Sandusky & Allard, 2017:25). Furthermore, Chiware and Backer (2018:13) elaborate on the role played by the library in creating awareness of RDM services within institutions and further argue that giving training and technical support to the users' libraries should take the forefront in the advocacy of RDM.

South Africa consists of 26 Universities and amongst these 26, few Universities have already employed RDM services that are effectively in place. At the same time, other institutions are working towards fulfilling the RDM services mandate (Kahn et al., 2014:299). Organisations, such as the University of Stellenbosch (SUN), University of Pretoria (UP), University of Cape Town (UCT), University of South Africa (UNISA) and University of the Witwatersrand (WITS) are amongst the institutions that already have RDM services (Kahn et al., 2014:299). The researcher randomly selected five institutions from the top ten ranking institutions and these institutions have several years of having RDM services in place (World University rankings, 2020). The institutions that the investigator selected have several years of running RDM services and they have mapped a clear path in implementing RDM (Data Repository Directory, 18 September 2020). Some of the institution's repositories available on the directory repository and their performance, are very impressive in terms of depositing and public visibility (Data Repository Directory, 18 September 2020). Those institutions are as the following: UCT, UJ, SUN, UP and WITS (World University rankings, 7 April 2020).

- UCT: utilizes Figshare for Institutions for their 2017-launched ZivaHub: Open Data UCT data repository. ZivaHub helps University of Cape Town principal investigators who require a repository to preserve and publicly share the data that backs up their published research findings. Under the guidelines of the UCT Research Data Management Policy, the repository service is offered. It offers free access to supplemental research data files and links to the authors'

individual scholarly works, which are housed on other platforms like OpenUCT(UCT,online 19 November 2022).

- UJ: is the University of Johannesburg's Open Access Data Repository. The data repository collects Research data/Raw data/Datasets, which are data in whatever formats or form collected, observed, generated, created and obtained during the entire course of a research project. The UJ RD have 21,282 views in total (UJ,online 19 November 2022).
- SUN: is a data archive for institutional research that can be used to register, archive, distribute, and disseminate data generated or obtained in connection with research conducted under the direction of Stellenbosch University. The public interface of the repository allows users to find content. Using the system's private user accounts, users from Stellenbosch University can upload, disseminate, or publish their research data. While working on their research projects, researchers at Stellenbosch University can communicate with researchers at other universities through SUNScholarData. The repository creates a pathway for distributing and opening up access to the research data from Stellenbosch University. Additionally, it makes interoperability and reuse of academic research data simpler (SUN, online 19 November 2022).
- UP: an open access electronic repository for digital content made by University of Pretoria students, faculty, and staff. Repository size is 63.111 entries, and it grows by 600 entries per quarter (UP,online 19 November 2022).
- WITS: Researchers have to because their funder, supervisor or journal has requirements. In that case, we are here to make compliance as painless as possible, work as much as possible in your current workflow and make sure what you do has scientific validity. We know this is not easy so we work with the E-research office to get you the resources you need (WITS,online 19 November 2022).

Therefore, all library services need to be marketed to target the relevant audience, such as researchers and postgraduate students (both Masters and PhD), as these patrons add value to the institution through their output of the research data they produce. Policies and advocacy of RDM are the main drivers of the visibility and marketing of the services is crucial. Technical infrastructure plays a crucial part in upholding standards when enhancing access in ensuring the best employment of RDM services to the academic institution, whilst making sure access to resources is seamlessly smooth (Schirrwagen, Cimiano, Ayer, Pietsch, Wiljes, Vompras, & Pieper 2019:2).

1.8 Research data management era

The data sets are potentially delicate, vulnerable to storage failures and technological ineptness can lead to the loss of valuable data (Cox, Pinfield & Smith, 2014:5). Besides, Chang and Hopkinson (2017:297) argue that institutional repositories in institutional libraries must converse their intellectual throughput to users of the institution and enhance online access and improvement of the status-core of libraries in the organisation. Research data service's visibility is crucial for the institution, as it will give the upper hand to retain the richness of the throughput of an institution while the institution partakes in marketing its services to the community of researchers. Chiware and Mathe (2015:3) support the notion by emphasising the importance of creating awareness and advocacy campaigns around RDM services in an academic institution. Visibility of the services rendered, leads to many ways of spreading the word, while marketing strategies follow that lead to a better understanding of the clientele served. Osinulu, Adekunmisi, Okewale and Oyewusi (2018:6) recognise this as a strategy of marketing an essential way to overcome and ensure security existence and persistence of the library. Furthermore, it supports the argument by stating that the value of marketing strategies improves users' awareness and promotes usage of the library assets and amenities while adding value to the image of the library (Osinulu, et al., 2018:6).

1.9 Significance of the study

According to Gupta (2016:126), libraries are preoccupied with upholding the standards of library and information science, there's negligence with full evaluation of the use of

advertising in university libraries and treat general issues like marketing as an afterthought. This study will fill a gap in the literature by applying marketing strategies of RDM services in academic library. The study's recommendations for improving the appeal of marketing RDM service in libraries could assist with better ways to resolve the issue.

1.10 Justification of the study

There is current literature documented, on RDM highlighting drivers for RDM development, research data services, infrastructure systems and the policies, but there is a gap in marketing RDM services effectively in academic libraries. The drive of exploration was to seal the appropriate in the body of knowledge by adding value to the story of RDM marketing in an academic library. The outcomes of this enquiry would contribute to the body knowledge of RDM and fills the existing gap in the literature while highlighting the importance of promoting RDM effectively. Furthermore, the outcomes would be used as benchmarking documentation by academic institutions that have interest in the marketing strategies of RDM in their designated institutions. Also, it will assist institutions that want to improve their marketing strategies.

1.11 Scope and delimitations

The research specifically pays attention on RDM in certain Universities, because the policies, frameworks and the advocacy, support structure, and technical supports are fundamental in shaping how RDM is supported and marketed within a different institutional context. Therefore, this study cannot be generalised. Furthermore, the study encapsulated the investigation of the strategies used to promote the RDM in selected institutions in South Africa. The succeeding institutions formed the centre of this study: University of Cape Town (UCT), University of South Africa (UNISA) University of Pretoria (UP), University of Johannesburg (UJ) and University of the Witwatersrand, who have already implemented RDM services in South Africa.

Delimitations are needed to make a study reasonable. The research was limited to library staff (involved in RD services such as Data Research Managers and Data Research Librarians), Information and Communication Technology (ICT) and the libraries. In addition, it also involved the collection of institutional documentation, as

well as policies related to research data services. The exclusion of other library division within the LIS sector were created as these divisions are not closely involved in the RDM service provision.

1.12 Definitions of key terms

1.12.1 RDM service

According to Chiware and Mathe (2017:2), RDM services are defined as storing, accessing and preserving data created in specific research or research projects. Therefore, RDMS is a service that is offered, whereby data are stored for easy access and preservation for use in research projects.

1.12.2 RDM

According to Koltay (2017:9), RDM is defined as management of data attained during the research process that ensures easily accessed, retrieved and preserved data to avoid duplication or loss, which will affect the validity of results. Furthermore, RDM is a mostly significant element of open data periodicals and data curation, enabling of taking the benefits of accessibility, findability of comprehension data and unnecessarily avoids duplication or loss and validation of results.

1.12.3 Marketing

Gupta (2006:5) described marketing as the controlling procedure in responding to classifying, expecting and filling customer requirements successfully. Writers like Osinulu et al. (2018:20), define marketing as that aspect, which libraries partake on different opportunities of library resources and in creating awareness of the service, as well tools to draw and keep patrons enlightened in the services they offer. Furthermore, the author, Gupta, defines marketing as both individual and structural activities that facilitate, and accelerate satisfying exchange relationships in an active environment through the creation, servicing, spreading, promotion and pricing of goods, services and ideas (Gupta, 2006:5).

1.13 Preliminary literature

As the South African academic institutions become more involved in RDM, it is necessary to create promotion of the services to engage and understand the audience served. Tenopir et al. (2015:24) emphasise the vital role played by research data in

academic institutions to support this notion. The literature review respectively addresses the following issues: types of research data services that are available and accessible, RDM in Universities, how DR is managed, ICT's role in managing research data, marketing RDM services, international and local marketing strategies, policies that supports RDM, policy and advocacy RDM in Universities. The evolving exploration ethos results in rising the effect of the digital uprising, characterised by intensive data, and interacted alliance (Cox & Pinfield, 2014:299). The technological revolution of the 21st Century exploration landscape is the multiplying of RD and exponential growth and in many cases, the digital intuitive. This multitude is not only the consequence of novel data being formulated from the involvement in exploration activities, but also mirrors the opportunities of distribution of data, which can be used to create novel data and innovative discoveries (Kahn, et al., 2014:296). Meanwhile, Surkis and Read (2015:154) recognise the importance of data's lifespan as the best instrument to clarify the centrality of data and the need to manage it.

1.13.1 Available RDM in Universities

The emerging research culture is a result of a growing influence of the digital revolution and is characterized by data-intensive and networked collaboration (Cox & Pinfield 2014:299). The technological revolution of 21st century research landscape is the multiplying of research data, growing exponentially and in many cases digital-born. These multitudes are not only a result of original data being generated from carrying out research activities, but also reflects possibilities of sharing data, which can be used to generate new data and new findings (Kahn, et al., 2014:296). RDM presents new financial challenges and opportunities for the higher education sector, as they must be obliged with the NRF mandate while investing and implementing RDM strategies. Lavoie (2012:68) revealed that monitoring of RDM is assessed in three perceptions:

- Technical sustainability contains the expansion of the RDM structure, tools and practice that are robust and scalable,
- Social sustainability encompasses mutual assurance to RDM from stakeholders with a shared interest in the supervision, curation, safeguarding future, location and re-use of RD, and
- Economical sustainability entails confirming of a regular flow of subsidies and all necessary assets to support RDM activities sufficiently and frequently available.

Meanwhile Surkis and Read (2015:154) recognise the importance of a data lifecycle as the best instrument to clarify the centrality of data and the need to manage.

1.13.2 Types of RD services that are available

The adoption of the NRF statement posed a new challenge for universities, not only to implement, but also to advocate and collaborate with the relevant stakeholders to sustain effective infrastructures for RDM services. Cox and Pinfield (2014:299) noted that the importance of infrastructures is that of maintaining relationship, integration of datasets and added availability through disseminated users' community. A data repository is where curated data are kept; data designated as being of archival significance and to be kept for a predetermined period. There are three ways higher education can provide research data services. The first option is to develop an in-house institutional data repository (an internal data repository, such as institutional data repository); the second option is to collaborate with external RDS providers and lastly pointing users to available and relevant data services. Meanwhile there are four types of repositories that institutions may choose when they are deploying the RDS, namely the subject-based repository, research repository, national repository and institutional repository (Armbruster & Romary, 2010:62).

- Subject-based repositories (commercial and non-commercial, single, and federated) usually have been set up by community members and are adopted by the wider community. Spontaneous self-archiving is prevalent as the repository is of intrinsic value to scholars.
- Research repositories are usually sponsored by research funding or performing organisations to capture results. This capturing typically requires a deposit mandate. Publications are results, including books, but data may also be considered a result worth capturing, leading to a collection with a variety of items. Because these items constitute a record of science, standards for deposit and preservation must be stringent.
- National repository systems require coordination - more for a federated system, less for a unified system. National systems are designed to capture scholarly output more generally, and not just with a view to preserving a record of scholarship, but also to support, for example, teaching and learning in higher education. Indeed, only a national purpose will justify the national investment.

- Institutional repositories contain the various outputs of the institution. Research results are important among these outputs, as works of qualification, as well as teaching and learning materials. If the repository captures the whole output, it is both a library and a showcase. It is a library holding an institutional collection, and it is a showcase because the online open access display and availability of the collection may serve to impress and connect, for example, with alumni of the institution or the colleagues of researchers. (Armbruster & Romary 2010:62-63).

Armbruster and Romary (2010:624) further raise the argument by stating the distinction between the four ideal types to investigate of how repositories may best serve scholarly communication. The rationale is that repositories may have many functions, but that unless they serve scholarly communication first and foremost, they will not be accepted and used in the long term. Acceptance and usage by the scholarly community is crucial for sustainability (Armbruster & Romary 2010:624).

1.13.3 How DR are managed

Data management is crucial in creating data discoverability, reachability, understandability, and making things to be available as a key part of what librarians do. Surkis and Read (2015:157) state that investigators recognise the significance of data management and data sharing, and it is far from rare to encounter investigators who are not prepared to devote the time in good data controlling practise and who are resistant to the notion of sharing their data. These superiorities can differ from investigator to investigator, as well as from discipline to discipline. Management of data facilitates new opportunity for librarians to provision of the exploration procedure. While on the surface, data controlling seems intimidating, librarians' experience with information organisation and making it discoverable are the skills, which are desirable to offer data managing services (Surkis & Read 2015:157).

Higgins (2012:22) defined three data controlling tactics that may be noticeable in an organisation:

- The administration and stewardship of RD inactivity with the exploration crew during and after research,

- The administration and stewardship of RD is commenced by the exploration crew with support from librarian professionals for such an extent of best guidance on implementation, training, and data managing planning, and
- The exploration team undertakes data management during the active research phase once handed over to the third party, such as library, or a domain-specific library.

Higgins (2012) explains that the management of RD is a continuous procedure that starts with a Data Management Plan (DMP) until the research is in motion and beyond the end of the project. Therefore, the control management of RD continuously moves beyond completion of the project.

1.13.4 ICTs role in managing RD

ICT plays prominent role in the RDM active procedure in supervising the research productions. Cox and Pinfield (2014:300) acknowledge accomplishments that contextualise issues, such as practical proficiencies, ethical concerns, legitimate matters, and control frameworks as primarily shapes that RDM practices and supports within various institutional contexts. A qualitative study by Pienaar (2011:3), led by the University of Pretoria on RDM, exposed that related to the ICT infrastructure, proficiency and institutional frameworks are imperative resources in RDM. The advancement of technologies both reinforces the power and management of RD in academic institutions.

A study by Tenopir, Birch and Allard (2012:6), on RD services on the Association of College and Research Libraries (ACRL) in the United States (US) and Canada, embracing qualitative and quantitative epistemologies, discovered that research institutions face numerous challenges while trying to preserve the massive amount of data for long-term practices. They further include the best mechanism of defining data in a reliable manner to retain involvement of data standards, continuously and efficiently data sharing, while permitting boundaries and complications to data sharing and data reuse, all while surviving with the increment of data being emerged (Tenopir et al., 2012:6).

1.13.5 Marketing strategies of RDM services

Awareness is crucial in RDM deployment. Cox and Pinfield (2014) documented the important part of promoting RDM awareness by Librarians in facilitating the use of

RDM. Grynoch (2016:1) quoted Britney, stating that Librarians can play a vital role in helping institutions in creating a data policy and stimulating the amendment of data policies that are detrimental to research. There is a different sentiment about the idea of Librarians as role players in the advocacy of RDM.

In contradiction, Chawinga and Zinn (2020:3) raised the issue of lacking RDM abilities amongst Librarians as a huge attribution to limited specialized growth in opportunities that would give Librarians the necessary skills-set to subdivide successfully into technical RDM services. Several readings have also testified a lack of RDM skills midst Librarians (Chiwere & Mathe 2015, Cox et al., 2014). Grynoch (2016:4) noted the solution is the Librarians' knowledge of RDM. Furthermore, Grynoch (2016:5) stated that Librarians must understand what research is performed at the institution and what terms are related to that field of research, concerning data. Besides policies, library staff in RDM also plays an imperative role in marketing RDM services in the institutions, as they have a better understanding than Librarians do. Grynoch (2016:10) encapsulates that RD managers in libraries need to become open data promoters and the spokes-persona for advancing data management standards, skills, and education. Some of the studies acknowledge the important role played by the Librarians in promoting RDM. In their discussion, Chawinga and Zinn (2020:7) acknowledge Librarians in their substantial movement in availing and advocating the concept of Open Access (OA), and also contend that professionals at the Universities could be better in following same suit with the perception of RDM and sharing data. This may involve the conduct of promotional and marketing events relating to the channels and benefits of sharing data (Chawinga & Zinn 2020:7).

1.13.6 Policies that supports RDM in Universities

Many academic institutions have tabulated policies that supports RDM, addressing various issues, such as intellectual property, ownership of the data and archiving, as well as reuse of the data. Piracha and Ameen (2019) mentioned that libraries are currently involved in developing new institutional RDM policies and services (Piracha & Ameen 2019:40). Many research institutions have developed research data services in their libraries in response to fund policies, both internationally and locally, such as NRF in a South African context. Chiwera and Mathe (2015:1) supported the notion by stating that in South Africa, some libraries are in the commencement to provide frameworks for RDM services with success, as policies are being formulated,

infrastructure set up, library staff trained, and awareness and advocacy campaigns held with academic staff and researchers. On the other hand, Piracha, and Ameen (2019:40) state that many Universities in the UK are still faced with the challenge of formulating RDM policies and the initiation of effective RDM services for their respective clients. Therefore, RDM services cannot be implemented without policies that supports its functionality. Furthermore, Piracha, and Ameen (2019:40) suggested that academic libraries take the lead in developing RDM policies that reflect institutional priorities.

1.13.7 Role of policy and advocacy in RDM

The advocacy of policy towards RDM has a major role to play as the director on implementation and promoting the service to the research community. In supporting the statement, Van Deventer and Pienaar (2015:44) mentioned that RDM openness is a great proficiency in developing high-level maintenance and the obligation is increased from policymakers and infrastructures in developing support for RDM. The development of policy strategies and advocacy for RDM is critical and requires activities for rational data service development. The RDM strategy and policy outlines an institution's RDM opportunities, intentions for the future while obtaining strategic plans. The involvement of stakeholders in RDM, such as governments, funders, academics, information specialist, IT specialists and ethics agencies, could be beneficial in the processes and requirements of creating policy frameworks while potentially creating awareness about RDM. Libraries should take a prominent part in RDM improvement through advocacy, promotion, and training of other RDM stakeholders in universities and research institutes, especially about employing RD through access, use and reuse (Cox, Verbaan & Sen, 2012b). Advocacy for open sharing of data adds value to the administration of an institutional DR, as well as data literacy among other issues that professionals and archivist should take into consideration (Cox, et al., 2012b). Research organizations should attempt RDM promotion that is needed at several levels of administration, researchers, and other stakeholders to share practices on RDM, as well as discuss current and future challenges related to curation of data, sharing, OA, and DR, to mention but a few. Moreover, Kahn et al., (2014:297) suggest that in South Africa promotion and ability of structure through conferences, workshops and symposiums, encourages the growth of knowledge in this context.

1.14 Research methodology

Methodology roadmaps the design and underpins the theoretical framework of the study. The success of investigation through examination addressed the mandate in creating and filling an existing gap in a body of knowledge creation. The discussion of design, methods and data gathering assisted the researcher in answering the exploration questions

This investigation predominantly adopted a quantitative motive approach. The quantitative technique is an arithmetic description and management of interpretations to describe and explain the phenomena. The quantitative procedure pursues the amount of which certain views and attitudes among respondents are recorded in, which could be gathered in summing up the generality in the investigation. With this investigation, a quantitative research approach was followed while a structured online survey with both closed and open-ended enquiries, was used as the data-gathering tool. The motive of the investigation was to explore the practices of a group of people (Kumar 2011:104). Kumar (2011) further states that the driver of the selection in quantitative research is to draw implications about a data set from which researchers have nominated the sample, whereas in qualitative research it is intended to utilise an in-depth understanding about the event.

The researcher opted for a quantitative research approach for the study, as the focus was on gathering numerical data and generalising it across groups of people and to explain the effectiveness, as well as the importance of marketing services while maximising the visibility of the new service to the targeted community.

1.14.2 Research approach

The research method was determined by two approaches, namely the inductive approach and deductive approach and both tactics involves building and testing a theory. The inductive approach applies when theory develops from the beginning whereas the deductive approach is based on an obtainable theory and literature reviews to improve a testable conceptual framework, based on existing knowledge (Neuman 2000:214). The adoption of an inductive approach for the investigation will be applicable for the study.

1.14.3 Research design

The research strategy of a study is the predominant plan an investigator draws out to implement an empirical inquiry. Creswell (2014:3) defined research design as plans and processes that guide the whole activity starting from assumptions to specific ways and tools for data collection, analysis, and explanation. In this study the researcher asked both closed and open-ended questions from the participants to gain more relevant information from the participants. The researcher found the survey method (online questionnaires) quite appropriate to be used for this study considering the population, sample size and the limited time available for completing this study. In addition, the identified universities are geographical located in different regions of the country. The survey was most appropriate owing to its large-scale application, ability to obtain good response rates, as well as its ability to allow the researcher to observe the attitude of the responses, amongst other advantages.

1.14.4 Population of study

Researchers usually have the mandate to draw conclusive results from large groups by taking a sample. A sample is a minor segment of the people regarded as the representative of the whole sum. Bloomberg and Volpe (2012:104) highlighted the importance of sampling in qualitative research as a purposeful activity. They further argue that sampling purposeful lies within a selection of information-rich cases with the understanding of the objective of insight and understanding the phenomenon under the current investigation. The reasonable sample size is determined by the availability of resources (Bloomberg & Volpe 2012:104). The population of the study was from the following academic institutions: University of Cape Town (UCT), University of Stellenbosch (SUN), University of Pretoria (UP), University of Johannesburg (UJ) and University of the Witwatersrand (WITS). The population was drawn from the academic libraries of the already mentioned institutions. The targeted population was 20 and the focus was more on the personnel such as research data managers, research data supporting staff, ICTL and the marketing team of the library who are the RDM service providers of the designated institutions. However, in the event of the other institutions not giving the researcher authority to continue with the research study, the researcher resorted to continuing with investigations, by using the reviewing of documents.

1.14.5 Sampling of the study

There are different kinds of sampling procedures in exploration. These samplings are as follows: probability and non-probability sampling (Henning, van Rensburg & Smit 2004:33). Probability is the ability of constitutently selecting from the whole population known, discussed as representative sampling. On the other hand, in non-probability, it is usage in sampling and a subjective verdict. The probability constituency will be designated from the population, is not known (Henning, et al., 2004:34). According to Kothari and Garg (2014:147), sampling permits accurate measurements of the study and enables sample errors, yet assisting with obtaining information related to the population. The sample of the study was limited to 5 research data managers from selected institutions, 5 research data supporting staff, 5 ICTL and the 5-marketing team of the library. The study used the purposive sampling technique. Purpose sampling is defined as the method of sampling that is used for special situations where sampling is done with specific intentions in mind (Kobus & Pietersen, 2020:220). Purposive sampling assisted the researcher with the sample of the study as the exploration of the target specific group of personnel, which are RDM service providers.

1.14.6 Data collection

This study was conducted through an online-surveys method. Due to the current state of health (Covid19), the investigator did not partake in face-to-face interviews. Therefore, the study was carried out through online platforms. There were trade-offs between depth and extensiveness, and also directing to specific and generalizability for populations that were provided by both quantitative and qualitative methods (Henning, et al., 2004:34). Quantitative data relates to positivist studies. This study utilised quantitative data sources. It was in the form of a structured online survey. An advantage of quantitative studies is that it is aimed at bigger populations, collecting a huge amount of data and managing information that represents and could be generalized (Henning, et al., 2004:34). Bloomberg and Volpe (2012:120) also emphasised the advantage of survey methodology as relatively unobtrusive and administered easily. A population for this investigation was to understand the impact of marketing strategies of RDM to have sustainable RDM services. Consequently, quantitative data is ideal for this study because the researcher's aim is to collect data provided, for accurate evidence and that is impartial which could be replicated for

future exploration. The online survey assisted the investigator to trace and find out which marketing strategies are implemented by the selected universities and offer a broader view on the effectiveness of their marketing strategies. The researcher used online software such as Google forms to create a survey for distribution by the Research Ethics Department of the selected institutions via e-mail of the targeted population of the institution.

1.14.7 Data analysis

For analysis of data, the researcher opted for the up-to-date version of SPSS to eliminate the level of human error. It also benefited in matching data sets; deliberation to note different range of data sets. The determination of this study discovered the effect of the existence and marketing strategies employed by academic institutions. Evaluations and exhibition of the data were made using diagrams and expressive statistics that entail the narrative and summary of data to gather single units of analysis (Welman, Kruger & Mitchell 2006:145). The statistical tool that was used by the instructor was descriptive statistics. Descriptive statistics is described as a collective name for different statistical methods that can be used to organise and summarise data in a meaningful way (Pietersen & Maree 2020:226). A standard code was formulated for inconsistencies and unanswered questions were checked to ensure data accuracy before analysis and interpretation. A data reduction/cleaning strategy was employed to summarise the information collected, through frequency analysis. This was done to filter out invalid or spoilt questionnaires and measure central tendencies to draw decisive conclusions from the data. Comparisons and presentation of the data were made using graphs and descriptive statistics, which entail the description and summarising of data attained from a collection of single units of analysis.

1.14.8 Reliability of data collection

Reliability in the study is when someone else can retest the investigator's data and obtain identical results (Welman, et al., 2006:145). Kahwati and Kane (2020:203) describe validity as a finding based on an analysis that is minimal and systematically bias. Bloomberg and Volpe (2012:125) highlight that in qualitative research it is essential to address the trustworthiness of the exploration. The reliability of an exploration device shows the consistence of the items being measured and the data gathered can be relied on (Yin 2009:219). Reliability can be seen as the extent to

which the results can be generalised, and similar results obtained if the research was conducted again (Franzel du Plooy-Cilliers, 2014: 254). Many quantitative studies have used internal consistency measures to ensure reliability, and one way to ensure this is to guarantee that the survey instrument does not provide respondents with leading questions (Straub, Gefen & Boudreau 2005).

1.14.9 Validity of data collection

According to Bloomberg and Volpe (2012:125), credibility is the correctness and credibility of the research from the researcher's view versus participants and the reader's point of view. The survey device was verified through a limited pilot investigation in assurance that it was suitable for the purpose that it is intended for. Construct validity tests was done to test whether variables for the same construct are drawn from the same pool and that the construct and concepts being studied have been correctly identified (Yin, 2009). For this study, different measures were identified for the different constructs that are being studied; tangible and measurable variables were identified for each of the abstract constructs. This is to ensure that findings can be generalised to the larger population tests for external validity. To ensure external validity for this study, a conceptual model was developed, and constructs were defined, and these constructs were quantitatively tested.

1.15 Ethical consideration

The researcher observed ethical considerations and took to account unethical treatment (Creswell, 2014:135; Kumar, 2011:246). Respect for the person's willingness to participate, must be on a full voluntary keenness, and based on full interpretation of what is involved. The research project also complied with the University of South Africa's policy on research ethics (2016), which amongst other principles call for "respect the autonomy, rights and dignity of research participants, promote beneficence, guarding against causing harm to the research participants in particular or people and non-maleficence and upholding justice." The researcher respected all moral procedures of the Research Committee of selected universities in South Africa that partook on the study. The right to the dignity, consent, privacy and confidentiality of the participants were respected by the researcher at all times. Assurance of privacy and confidentiality was given to the participants before and after the study.

The researcher embraced all the universities ethical consideration by applying for the ethical clearance through the institutional research division. Some of the institution's ethical protocol does not allow external researcher to do research if the target population is staff members of the institution but only allow when the research is targeting students of the institution.

1.16 Dissertation chapter outline

This section entails the map of sections for the study.

Chapter One: Introduction and background

The introduction, the context of the investigation, research problem, research objectives and questions, were addressed in this section.

Chapter Two: Conceptual framework and literature review

This section addressed the documented records and the conceptual framework of the study.

Chapter Three: Research methodology

Coverage of the research methodology highlighting the methodology and population, sample size, instruments, data collection procedures and ethics were covered in the section.

Chapter Four: Data analysis and demonstration of results

Analysis of data tabulated; the interpretation and discussion of outcomes were covered in this section.

Chapter Five: Discussion of the findings

This section discussed the outcomes of the investigation.

Chapter Six: Summary, conclusion, and recommendations

This chapter covered the conclusions and recommendations founded on the outcomes of the study.

1.17 Summary

Chapter One introduced the study and provided background information of the study about RDM in selected Universities. It also encapsulated the research problem, the aims and objectives, definitions of key concepts discussed, and an overview of the research design and methodology used in the study. It has also drawn the proposed structure of the thesis and a summary of the other chapters that were established in the dissertation.

CHAPTER TWO

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

This part presents conceptual frameworks that centralize this investigation and the analysis of relevant literature that directed the objectives of the study, as tabulated in Chapter One. Caffrey (2020:1) defined conceptual framework as an exploration tool that is used to establish the fundamental structure that focuses and guides a project. Furthermore, it is a conjectural that outlines ideologies, expectations plus procedures that is supported within a broader conception (Caffrey, 2020:1). Gummer and Mandinach (2015) add on by stating that a framework is envisioned to enlighten the dialogs' evolving data literacy so that it will continue with enhancement of an operational definition of the paradigm (Gummer & Mandinach, 2015:2). Both conceptual framework and literature review are the main drivers in mapping the knowledge while addressing the objective of the investigated study in answering the problem statement of the study.

Mouton (2008) describes the review of literature as an organized process of documentation, location and analysis of records, encompassing evidence related to the proposed exploration problem being investigated (Mouton, 2008:35). Literature reviews focus on exploration outcomes and are perhaps the most common aspect of the exploration, based on the objectives of the study. Neuman (2006:25) added by stating that the literature review is distinct as an interpretation of what has been distributed on an area by official scholars, organisations, and researchers. Literature review is a main point in conducting exploration as it derives the context of the study into what others have encoded (Mouton, 2008:35). The reputation of revising existing work, according to Neuman (2006:25) is to assist the researcher to launch how other researchers have investigated similar problems. Steering a literature review enables the researcher to understand and internalise the literature of the subject matter present, with the goal of illustrating the relevance of the verdicts related to the prevailed body of literature (Henning, Rensburg & Smith, 2004:27).

The review of the investigation accordingly addresses the following issues: types of research data services that are available and accessible, RDM in Universities, how

DR is managed, ICTs role in managing exploration data, marketing RDM services, international and local marketing strategies, policies that supports RDM, as well as policy and advocacy RDM in Universities. The mandate of the NRF statement regarding the endorsement of RDM by South African Universities has been adopted and most institutions are deploying the mandate. Tripathi, Shukla and Sonker (2017:417) viewed libraries as adapters of the changes brought by the technological waves and libraries have moved towards providing RDM services to their investigators. With this uprising of technological revolution, Librarians must be acquainted with the change as they are the connectors of the operational operators of the service delivery at the institutions.

Morgan, Duffield and Hall (2017:299) applaud the role played by Librarians in supporting researchers in this ever changing and expanding library landscape. Furthermore, they added the significance of trends that entails library operation in unification with other University stakeholders in supporting the complexity of RDM sustainability (Morgan et al., 2017:299). RDM as a new trend in the academia spectrum, also need library champions that are experts who will be the best executors of the services needed by the targeted clientele. Faniel and Connaway (2018:105) acknowledge information specialists' embracement of data management services in supporting researchers' daily needs for effective RDM services. Although Librarians are still faced with upskilling, RDM poses challenges that each institution must overcome for the success of deploying effective, as well as sustainable RDM services. Technological resources, personnel resources, researchers' perceptions about the library, leadership support and communication, coordination, and collaboration were mentioned as tabulated by Faniel and Connaway (2018) as influencers of RDM (Faniel & Connaway, 2018:105). These affects procedures and activities that takes place in RDM processes. Faniel and Connaway (2018:100) mentioned some of the RMD components that are affected by the influencers, consist of various events and courses associated with the data lifecycle, evolving the design and creation of data, storage, security, preservation, retrieval, sharing, and reuse, all considering technical capabilities, moral considerations, legal issues, and governance frameworks.

2.2 Conceptual framework

The mapping of the exploration output is influenced by the conceptual framework as it traces knowledge from the existing literature. Caffrey (2020:1) explains that an intangible framework scrutinizes prior exploration and uses current schemes and strategies to guide recent projects; it is derived from an idea to identify the concepts included in compound phenomena and shows relationships that are also vital in exploration studies as it sets the foundation of how concepts are related.

Academic institutions have embarked on the data digital with academic libraries, who actively inherited the RDM service role as champions in advocating RDM development activities. Many authors have identified and addressed common subjects within RDM ranging from directing RDM needs and evaluation in user societies (Corrall et al., 2013: 646); preparedness of libraries, as well as the readiness of the libraries (Chiwere & Mathe 2015, Chiwere & Berker 2018); policy development; advocacy, promotion, and training; consultative services; data repository progress (Cox & Pinfield 2013; Read, Koos, Miller, Miller, Phillips, Scheinfeld & Surkis 2019). The RDM pyramid projected by Lewis (2010), advocates a broader role for libraries and information specialists, plus integration of RDM into education of entry level and in schools of Library and Information Science, as well as effective participation in national policy development.

Despite all challenges faced by institutions, numerous authors acknowledge libraries for resuming with the RDM agenda without reluctance. Lewis (2011:13) acknowledges the need for academic libraries in educating cognizance of the trials of data managing within their organisations and initiating a dialogue about it through different ways and Lewis (2010:11) predicts a pyramid model of nine regions of RDM motion for libraries. The study adopted the model presented by Lewis in completion of the investigation. The analysis of each level gives a clear indication of the key role players of RDM in the University library. Below the investigator narrated Lewis's pyramid with an in-depth explanation of each step in the pyramid and how it influences the procedures of RDM in the University library.

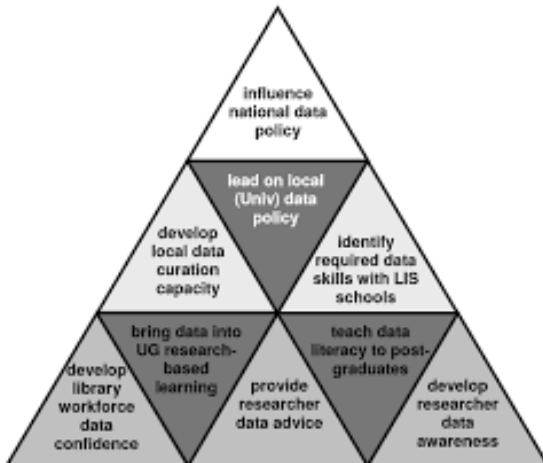


Figure 1: Lewis (2010:12) pyramid analysis

2.1.1 Key components of pyramid model

The proposed pyramid by Lewis (2010) consists of nine elements and each element plays a significant role in the functionality of effectiveness of RDM. Lewis' conceptualized elements are as follows: develop library workforce data confidence; convey data into undergraduate exploration-based learning; provide exploration data advice; teach data literacy to postgraduates; develop investigator data awareness; identify required data skills with LIS schools, lead on local data policy and influence national data policy. The pivotal role played by these elements in measuring sustainability of the RDM services in an institution, is enormous. In the following section the investigator zoomed in on each element in a detailed manner.

2.1.1.1 Develop library workforce data confidence

The introduction of a new service is crucial and all relevant stakeholders need to be well informed about the service while service providers are well equipped with the pros and cons of service delivery. Lewis (2010:12) composed the first key component of the pyramid model as the most important aspect when it comes to nurture the general responsiveness of the existing institutional library workforce in relation to both e-research and controlling data matters, with the objective of preparing information specialists to host dialogues with academia associates and exploration students on these issues (Lewis, 2010:12). Predominantly the prime spectators are academic liaison information specialists, but he nonetheless added library staff, such as systems teams, repository managers and e-resource managers, who might as well profit from a better level of familiarity about and understanding of the data management setting (Lewis, 2010:12). The endorsement of the new service by the institution results into

resurrecting the need to elevate the knowledge and skills of their persona in order to prepare them for embracement of the service. Numerous studies have identified skills gaps in Librarians patterning advocacy of RDM service as a newly launched service in institutional libraries and Librarians are in the forefront of clientele service providers (Chiwara & Mathe 2015; Chiwanga & Zinn 2020; Kahn et al., 2014). Furthermore, Lewis (2010:12) highlighted the importance of the association by library staff in ensuring the speed of the guidelines for principal funders of exploration in their institutions, not only open access related to throughputs, but data related and the advocacy of the current national and discipline-based data centres. Many institutions, both national and international, are engaging with RDM in various developmental processes and procedures. Lotter (2014) states that many different South African academic and exploration-based institutions are in different stages of implementing (developmental stages) RDM policies. Even in a global context, literature about the importance of policy development; advocacy, awareness, and training; advisory services; and data repository development, has been published (Cox & Pinfield 2013). Mushi et al. (2020:4) also argue that for the effective conception of an RDM strategy, funders and publishers should influence institutional implementation of RDM services.

It is crucial to market each service enthusiastically in the sense that it attracts the attention of the targeted audience. Read et al. (2019:433) mentioned some useful marketing strategies, such as conducting attentive promotion efforts for a series of data programs and this is regarded as a helpful way to market library RDM services to the exploration community and beyond. According to Read et al. (2019:439), data series are proven to be useful promotion tools and an effective means of building and strengthening alliances outside the library. These authors further state that the provision of training and consultation services for developing institutional repositories improves the visibility of exploration data (Mushi et al., 2020:4).

2.1.1.2 Provide researcher data advice

Lewis (2010) states that on stage two institutional libraries might not (yet) have been capacitated with the ability to provide local data management for digital datasets, nevertheless once they have, they will be involved in the matter. Further emphasis about the relationship, must be enhanced with relevant stakeholders (i.e., investigators). However, guidance offered by many institutional libraries on open access and other aspects of scholarly communication and data management, has

been regarded as a natural extension of this role (Lewis, 2010:13). Buys and Shaw (2015:4) highlighted the crucial initiative roles undertaken by other academic institutions across the globe in the adoption of effective RDM practices. Mushi et al. (2020:5) supported Buys and Shaw (2015) by mentioning that the implementation of RDM within an academic institution's strategic plans and design of policy, sustains RDM services. Lewis (2010:13) further alludes the importance of collaboration between libraries and IT services to have a co-operated approach in implementing sustained services to the clientele. Libraries do not operate in a vacuum, therefore the engagement with all relevant campuses and external stakeholders are crucial in the effectiveness of a sustainable RDM service. These authors, Goben and Griffin (2019) also emphasised the need for the library to have an effective collaborative affiliation with units, such as Information Technology for technical support needed by the users (Goben and Griffin, 2019:912). The relationships that a library build, assist reaching out to clients easily as they can assist with word-of-mouth to spread news quicker.

2.1.1.3 Develop researcher data awareness

On the third component, Lewis (2010:13) highlighted the important role played by institutional libraries in raising awareness of the challenges of managing data within their organisations and initiating debates about it through a range of platforms. Each institution faces new challenges when it comes to the launching of a new service. Akers et al. (2014:181) indicated the library culture through restructuring parts of topic associations, developing new engagement platforms, creating partnerships amongst various library divisions, and pursuing to strengthen and maintain corporations with various institutional stakeholders. Lewis further argues that for libraries boarding on data management locally, advocacy is essential to consider certain aspects closely in ensuring their communications are affiliated with various organisational shareholders, such as exploration administrators (Lewis, 2010:13). Cox et al. (2017:2183) supported the statement by Lewis (2010), by stating that advocacy and governance from an exploration centre have a positive impact to the implementation of the RDM by the academic institution and also provide the institution with guidance as an outcome for both the library and exploration office that contributes as an active role in co-ordinating and promoting the development of the RDM.

2.1.1.4 Teach data literacy to postgraduate research students

The fourth component that Lewis (2010:13) mentioned is that training postgraduate exploration students is a crucial effect area relative to RDM, as it offers a chance to encourage the way in which upcoming investigators approach data when preparing their exploration. The introductory training mandates postgraduates and assists with cultivation towards the investigator's profession. Furthermore, the purpose of developing postgraduates at an entry level, leads to a thoughtful way in which upcoming canvassers generate and use of data, as well as describe it to facilitate upcoming retrieval of their data (Lewis, 2010:14). Brown et al. (2015:225) explain the activeness of the library as one of the vendors within an academia that is regarded by many as partaking in a major part in dealing with the exploration society, specifically in managing their data. The library as the main player, needs to be hands-on with service delivery and keep up with the changes of the curricula.

2.1.1.5 Bring data into undergraduate research-based learning

In this fifth component, Lewis (2010:15) mentioned the impact of preparing undergraduate syllabuses that include a thesis requirement that can expose learners' knowledge in generating data, and an opportunity to invest in developing good practice among those who have an interest in exploration careers. Nurturing the career at an early stage, assists with the elimination of common errors while adding to effectiveness of service delivery. Furthermore, the effective RDM on a broader scale, may also convey scholarly benefits for undergraduate training, by empowering students to access and use real RD in an educational setting, a strategy that supports well with the use of problem-based and inquiry-based procedures in the syllabus (Lewis, 2010:15). Davis and Cross (2015:7) further narrate that support for institution through workshops, facilitate rich and engaging training opportunities to address issues faced by investigators, related to exploration data.

2.1.1.6 Develop local data curation capacity

With the sixth component, Lewis (2010:15) highlights an increment of incident studies that is present to inform conclusions by library and organisational managers, many of them taking institutional repositories (IRs) as an initial point for data curation. The curation of data is crucial as it assists with retrieval of the data by the users. This rising RD services system endorses the acknowledgement of records as intellectual throughput and assists with campus engagement with investigators throughout the

exploration lifecycle (Akers et al., 2014:181). On the other hand, Creaser and Spezi, (2014:6) emphasised that the new part for information specialists, especially in provision of the procedure of grant, are emerging from the institutional library and information specialists need new skills primarily in exploration provision. Librarians also need to be equipped with the data curation skills to assist with managing data repository before the implementation of the RDM services. Without data curators' skills, information can be archived incorrectly (Creaser & Spezi, 2014:6).

2.1.1.7 Identify required data skills with LIS schools

With the seventh component, according to Lewis (2010:15), the current library persona can make a major part to get exploration data curation on the organisational map, even for libraries with well-built IRs, it are possible to discover the extra skills they need to provide momentous data curation capability, locally. Furthermore, the role of library managers in recognizing the skills gap and working in association with Library and Information Science (LIS) schools, is to advance new training and development resources to fill it (Lewis, 2010:15). Chiware (2020:403) mentioned openings in the restricted studies that have discovered RDM services in South Africa, particularly issues of institutional education and continued professional development for information specialists in data management. Furthermore, observations about existing Library and Information Science (LIS) syllabus in the country to reply to the new RDM services' needs are still insufficient. He further narrates that as RDM services commence to multiply in academic and exploration libraries, there is a real need to find appropriate models that can be used to advance new curricula and home-grown data management, as well as continuing professional development courses that could address the current skills gap (Chiware, 2020:403).

2.1.1.8 Lead on local data policy

According to Lewis (2010:18), University exploration, invention of small groups and top management groups are necessary to recognize the state of the managing data task, as well as the benefits of a clear approach across the organization. The approved investment business case is also needed in this specific area and their critical obligation in assisting to bring hesitant investigators on board. In addition, repository managers and staff must be data-literate, as well as directors of the library must be able to state both challenges and ideal solutions with their senior co-workers (Lewis, 2010:18). Hamad et al. (2019:17) highlighted the importance to form an alliance with

other libraries and exploration centres in a mandate to build a solid RDM services policy and to gain from exploration centres in an investigation's experience. Moreover, it is crucial to increase persona awareness about their part in proving RDM technical services along with their informational services.

2.1.1.9 Influence national data policy

Lewis (2010:18) indicated that information specialists are assumed to be major performers in national policy arenas for RD, where these exist. Mushi et al. (2020:4) argue that the actual concept of an RDM strategy, funders and publishers, affect the organizational implementation of RDM services. These authors further state the importance of provision of preparation and consultation services for developing IR's visibility of exploration data (Mushi et al., 2020:4). Buys and Shaw (2015:4) highlighted the initiatives undertaken by other academic institutions across the globe in the adoption of effective RDM practices.

2.2 Types of RD services that are available

The adoption of the NRF statement posed a new challenge for Universities; not only implementation, but also to advocate and collaborate with the relevant stakeholders to sustain and effect the infrastructure for RDM facilities. Cox and Pinfield (2014:299) noted that the prominence of infrastructures that maintains prevalent relationships, integration of datasets and added availability through disseminating users' community. DR is where curated data are reserved; data elected as being an archival impact and to be reserved for scheduled periods. Pampel, Vierkant, Scholze, Bertelmann, Kindling, Klump, Goebelbecker, Gundlach, Schirmbacher and Dierolf (2013:1) state that a data repository resumed in 2012, to index registered RD repositories for investigators, institutional funding, libraries, and producers' outline of the heterogeneous exploration data's repository landscape. Furthermore, digital RD occurrence in various data types, aggregation levels and data formats, are well-versed by the exploration of various sectors and their methods. Regarding the drive of access for usage and re-usage of exploration data, digital exploration data have no added value without their metadata and proper records relating to their context and the tools used to create, store, adapt, and analyse them (Pampel et al., 2013:2).

There are three ways in which higher education can provide exploration data services. The first option is to develop an in-house institutional data repository (internal data

repository, such as institutional data repository); the second option is to collaborate with external RDS providers; and last is to point users to available and relevant data services. Meanwhile, there are four types of publication repository institutions available, when they are deploying the RDS, namely the subject-based repository, exploration repository, national repository system and institutional repository (Armbruster & Romary, 2010:62).

- Subject-based repositories (commercial and non-commercial, single, and federated) are where the community members normally are establishers, thereafter broader community. It has an intrinsic value to academics as unprompted self-archiving is prevalent to the repository.

- Research repositories are normally funded by exploration funding or performing organisations to capture outcomes. The depositing command is a mandatory requirement for capturing. The results are of publications, such as books, but data might also be considered a result worth capturing, as collection leads to various items. The constituency of items, such as science records' depositing standards and preserving, should be restricted.

- National repository systems require coordination and a federated system with a less incorporated system. The intention of national systems is to encapsulate scholarly throughput generally and without a view of preserving a record of scholarship, also in supporting, teaching, and learning in institutional education. Certainly, a national purpose only justifies national investment.

- Institutional repositories contain various throughputs of the organisation. The importance of exploration results' throughputs are works of qualification, as well as teaching and learning materials. The encapsulated repository throughput as a whole is for both a library and a showcase. The holding of the library's organisational collection and showcases have open access online and the availability of collection regarded as an impressive way to connect with the alumni of the institution, as well as colleagues of the investigators (Armbruster & Romary, 2010:62-63).

Armbruster and Romary (2010:62) further differentiate ideal types and categorise into four types, yet scrutinize these repositories on how best they may serve scholarly communication. The rationality of these repositories has many functionalities unless scholarly communication is served first and foremost, there will be no establishment

and usage in the long term. The crucially sustainability by the scholarly community in accepting and the usage, is important (Armbruster & Romary, 2010:62). Wilkinson, Dumontier, Aalbersberg, Appleton, Axton, Baak, Blomberg, Boiten, da Silva Santos, Bourne and Bouwman (2016:2) highlighted the bridging of barriers in data discovery and re-usage of data that is archived in these various repositories, which leads to the emergence of many general-purpose data repositories at scales ranging from an institutional repository to others. Faniel and Connaway (2018:114) on their exploration findings, discovered that collaboration among other institutional avenues creates multiple data repository centres that coordinates RDM events for underserved disciplines, worthwhile to be considered alternatively. They further added the implementation of cross-institutional repositories at elected institutions, and personnel from areas that the organisation can assist from, by coordinating support for investigators' RDM needs, within disciplines (Faniel & Connaway, 2018:114).

2.2.1 Subject-based repositories

Subject-based repositories are used interchangeable with disciplinary RD repositories (Pampel et al., 2013:4). These authors, Pampel et al. (2013) and Armbruster and Romary (2010), all state that subject-based data repositories are designed with the specification to assist with the data needs of a specific exploration community. Armbruster and Romary (2010:67) also state that subject-based repositories have largely increased in numbers of items' availability with the efforts of securing the quality of submissions by the users. Furthermore, it is mostly designed to offer both a specialist domain knowledge and the data management expertise, associated with the needs of specified clientele in assuring that data are properly kept and used effectively by the targeted community (Pampel et al., 2013:5).

2.2.2 Research repositories

Pampel et al. (2013:4) described a research repository as a project specific exploration of data repositories. Armbruster and Romary (2010:68) mentioned that exploration repositories mostly holds final exploration outputs, regarded as peer-reviewed outputs. Yet exploration and national repositories are like each other when it comes to processed and procedures.

2.2.3 National repository

Armbruster and Romary (2010:64) assert that the role played by institutional repositories is obviously tangled with the national exploration duty with regards to reviewed publications. According to Pampel et al. (2013:4), national repositories are regarded as a multidisciplinary exploration data repository. They further state that alongside disciplinary and institutional approaches, are also RD repositories serving multidisciplinary needs (Pampel et al., 2013:4). The massive, published knowledge in national and subject-based repositories have proven to assist investigators with access, archiving, and reuse of datasets (Armbruster & Romary, 2010:66).

2.2.4 Institutional repositories

Pampel et al. (2013:4) state that institutional RD repositories are run by an institution, such as an institutional or exploration institution. They also mentioned that at an institutional level the scope is multidisciplinary orientated (Pampel et al., 2013:4). In contrast, Armbruster and Romary (2010:68) argue that institutional repositories are not specifically dedicated to any designated exploration community base. Instead they play a vital role in evaluation of institutions' and departments' throughput (Armbruster & Romary, 2010:68). Armbruster and Romary (2010) further state that the mandate carried by institutional repositories in policing of depositing data into repositories, assists scholars, informational specialist, and administrators in insurance of deposited data that are appropriate for assessment of institutional repositories while mapping the success of the institution's exploration output (Armbruster & Romary, 2010:68).

2.3 Available RDM in universities

Many institutions embarked on implementing RDM as per mandate of funders. Morgan, Duffield and Hall (2017:299) alluded that the most significant trend is for libraries to work in conjunction with other units in their institutions, such as information technology units and exploration offices to support RDM sustainability. With the emerging exploration culture, it resulted to the rising impact of the digital uprising and was characterized by data-intensive and networked association (Cox & Pinfield, 2014:299). The technological revolution of the 21st-century's exploration landscape is multiplying RD and growing exponentially, as well as in many digital-born cases. This creation of original data may not only result in multitudes of carrying out exploration activities, but also as a reflection of opportunities of data-sharing that might be used

to create new data and new discoveries (Kahn et al., 2014:296). RDM presents new financial challenges and opportunities for the higher education sector, as they are obligated by the NRF mandate while investing and implementing RDM strategies. Lavoie (2012:68) revealed that monitoring of RDM can be assessed in three perceptions:

□ Technical sustainability contains the expansion of RDM structure, utensils and practices that are robust and scalable. The investigator Heue (2020:2) highlighted the importance of organizational and technical infrastructure (Software and hardware) in the implementation of RDM in Universities and exploration institutions. Along with these authors, Kahn et al. (2014:302) also allude the essential part of Information and Communication Technology (ICT) departments in sustaining the service delivery of RDM in the institution. Cox and Verbaan (2016: 320) raise a concern with the IT services lacking a strong emphasis when it comes to supporting initiatives, such as RDM. Kahn et al. (2014:300) also highlighted further concerns as they feel that ICT should play a prominent part in RDM, and curation is the hindering gap in RDM services. In supporting of this argument, Chawinga and Zinn (2020:8) shared the same sentiment as raised by Cox and Verbaan (2016), by affirming that poor RDM infrastructure and deficiency lead to staff not being able to render this service to users. They further indicate that library and IT are largely more independent professional services providers, in which exploration should form one client service provider (Cox & Verbaan, 2016:320). Furthermore, the disconnection needs to be reinforced by having specialist in-front facing teams in IT services, while the person who is working on fundamental infrastructural services, had no straight contact with clientele.

□ Social sustainability encompasses mutual assurance to RDM from stakeholders with shared attention in the supervision, curation, safeguarding future, location and re-use of RD. According to Brown et al. (2015:225), the library is among the vendors inside an organisation that is regarded by many as a major player in engaging with the exploration society, specifically in managing data. Furthermore, Davis and Cross (2015:2) argue that supporting data management by the library is attractive to such an extent that it renders an avenue for building cooperative networks (amongst the stakeholders), the support of the library integrates into the exploration process, and open access support of data exploration. Moreover, Brown et al. (2015:232) supported the statement by stating that RDM poses challenges for libraries to rapidly correspond

into an ever revolving atmosphere through association, specifically in providing support networks.

□ Economical sustainability entails confirming the regular flow of the subsidy and all necessary assets to support RDM events that are adequate and regularly available. Chawinga and Zinn (2020:8) urge about the collaboration among relevant shareholders (such as Librarians, Director of Research, Research office) in supporting management for financial supporting in both long and short-term capacity building, such as data infrastructure (expanding the current data repository) and responsibilities of RDM stakeholders. The investigators, Hamad, Mahal and Al-Soub (2019:6), also identified potential parts played by Librarians to support investigators and investigation, including providing advice on finding sources that are available while funding contributes to the return investment of the institution.

Meanwhile, Surkis and Read (2015:154) recognise the importance of the data lifecycle as the best instrument in clarifying the centrality of data and the need to manage. On the other hand, Wilkinson et al. (2016: 6) mentioned fairness as a requirement for proper management of data and data stewardship, as it is a good guide when it comes to evaluating whether particularly application choices are rendered in enhancing digital exploration artefacts that are Findable, Accessible, Interoperable, and Reusable (FAIR).

2.3.1 RDM in higher education

Academic libraries need to relook at their marketing strategies to ensure that when highlighting the importance of RDM, they are attracting the relevant audiences. Si, Zeng, Guo and Zhuang (2019:283) believe that academic libraries are forced to review their maintenance towards investigators and parent institutions, especially the exploration impact-depth to fit within the trending demands of the digital wave of the 21st century. Meanwhile Tripathi, Shukla and Sonker (2017:417), state that Universities' universal focus is on exploration accomplishments which have enormously enhanced the creation of exploration data. RDM plays a vital role in enhancing an institution's academic profile and ranking within the higher education landscape. RDM ensures that an academic institution complies with standards that promote the storage, preservation and sharing of data collected during the exploration process (Schirrwagen et al., 2019:2) Academic libraries have a vital part in marketing

the use of RDM, as effective application of RDM will influence the academic profile of the institution. The support structure of the RDM services plays a key role on the pro-activity of effectiveness of RDM in the in higher education (Chiwere & Mathe, 2015:3).

According to Chawinga and Zinn (2020:1), currently the status core of RDM creates a chance for an academic library to consolidate and strengthen a broader notice for taking a natural role in RDM services. They further narrate the adoption of RDM policies that is essential as it promotes the conceptualisation, popularisation, embracing and operationalisation of numerous RDM events within the African institution setting (Chawinga & Zinn, 2020:1). Si, Zeng, Guo and Zhuang (2019:296) mentioned that when libraries are strategically planning, they must pay more consideration into new, practical and important exploration supporting services in ensuring vigorous exploration data services, sustaining and continuing open access and conservation, advancement of scholarly publishing mechanisms, providing investigation with effective measurement and investigation monitors and offering exploration sessions and exploration methods that are recommended, based on investigators' needs.

2.3.2 Accessibility of RDM in Universities

RDM policy is the main driver of accessibility of the RDM. Huang, Cox, and Sbaffi (2020:4) highlighted the role played by the documentation that contains instructions on how to access the datasets from RDM. Meanwhile Si et al. (2019:296) emphasised the importance of guides as an access point and instructional documents that assist in meeting the investigators' needs. It is crucial for the deposited data set to be easily accessible as it have an impact on mapping the through-put of the institution. Tripathi et al. (2017:417) argue about the importance of advocating for exploration data that are uploaded into open access data repositories to be publicly accessible, browsing, and usable, as well as validating the reported exploration. The accessibility of the data also assists with the collaboration amongst academics. The study by Si et al. (2019) also noted the collaboration of investigators, not just within their scope of exploration interest, but also rather extended to external boundaries. In addition, Si et al. (2019:298) added the impact of collaboration as the paradigm shift of technical exploration that is developing towards digitization, and data intensification results on the rebirth of innovative cross collaboration. Furthermore, accessibility of available material is regarded as citizens' rights and the value that libraries add to the community

(Haung et al., 2020:8). In contrast, Haung *et al* (2020) discovered that lacking marketing and knowledge about RDM, results on reluctance of exploration to partake on depositing and granting access to their exploration data (Haung et al., 2020:8). For the institutional library to overcome what is raised by Haung et al. (2020), according to Si et al. (2019), institutional libraries could advertise the exploration of supporting services vigorously and become a norm (Si et al., 2019:296).

2.4 How DR are managed

Data management is crucial in creating data discoverability, reachability, understandability, and making things to be available as a key part of what Librarians do. Surkis and Read (2015:157) state that investigators recognise the significance of data management and data sharing, and it is far from rare to encounter investigators who are not prepared to devote time to good data's controlling practise and who are resistant to the notion of sharing their data. Si et al. (2019:291) state that Universities are also ensuring that their infrastructure, tools and support enable investigators to maximize the value of their exploration data deposited. According to Wilkinson, Dumontier, Aalbersberg, Appleton, Axton, Baak, Blomberg, Boiten, da Silva Santos, Bourne and Bouwman (2016:6), fairness is a prerequisite for the suitable management of data and data stewardship. They further added that outcomes of great management of data and stewardship are highly important in facilitating the good quality of digital publications as an ongoing process of finding, valuation, and reuse of data sets. Nevertheless superiorities can differ from investigator to investigator, as well as from discipline to discipline. Management of data facilitates a new opportunity for Librarians of a provision of the exploration procedure. While on the surface, data controlling seems intimidating, Librarians' experience with information organisation and making it discoverable, are the skills desirable to offer data managing services (Surkis & Read, 2015:157). In contrast, Chiware (2020) views the rapid growth of managing the exploration data as complex and it may lead to threats of loss of data, privacy, security, trust, and the attitude of investigators towards its management by information specialist as it may pose many challenges (Chiware, 2020:405).

Meanwhile, Higgins (2012:22) defined three data controlling tactics that may be noticeable in an organisation:

- The administration and stewardship of RD inactivity with the exploration crew during and after exploration. Whitmire and Boock (2015:382) noticed that academic libraries increase the arrangement and exploration support in the capacity of data stewardship.
- The administration and stewardship of RD is commenced by the exploration crew with support from information specialist professionals for such an extent of best guidance on implementation, training, and data managing planning, and
- The exploration team undertakes data management during the active exploration phase, once handing over to the third party such as the domain-specific library.

Hamad *et al.* (2019:2) argue that a library should present services in a corporation model, being a lively provider through the entire exploration process. Higgins (2012) explains that the management of RD is a continuous procedure that starts with DMP until the exploration is in motion and beyond the end of the project. Therefore, the control management of RD continuously move beyond completion of the project.

2.5 ICTs role in managing RD

Kahn *et al.* (2014:302) allude that the role and understanding of the essence of the role of technology, as well as its mandates towards Information and Communication Technology (ICT) departments, plays a contributing factor in anxiety of new technology, as it continuously leads to reluctance in challenging the resource. RDM challenges enhances new technology and emerging technology when it comes to capabilities of the technological revolution. ICT plays a prominent role in RDM active procedures, in supervising the exploration productions. Cox and Pinfield (2014:300) acknowledge the accomplishments that contextualise issues, such as practical proficiencies, ethical concerns, legitimate matters, and control frameworks as primarily shaping RDM practices and support within various institutional contexts. A qualitative study by Pienaar (2011:3), led by the University of Pretoria on RDM, exposed that related to ICT infrastructure proficiency and institutional frameworks, are imperative capitals in RDM. The advancement of technologies both reinforces the power and management of RD in academic institutions.

While an investigation by Tenopir, Birch and Allard (2012:6) on RD services on Association of College and Research Libraries (ACRL), in the United States (US) and Canada embracing qualitative and quantitative epistemologies, discovered that

investigation organizations face numerous trials while trying to preserve the massive amount of data for long-term practice. They further include the best mechanisms of defining data in a reliable manner to retain evolvement of data standards, continuously and efficiently sharing data, while permitting boundaries and complications of sharing data and re-usage of data, all while surviving with the increment of data being emerged (Tenopir et al., 2012:6).

Goben and Griffin (2019:911) state that providing sustained exploration infrastructure development and maintenance support, is important for RDM services. These authors emphasised the need for the library to have an effective working cooperation with units, such as IT for technical support needed by the users (Goben & Griffin, 2019:912). Kahn et al. (2014:302) debate that technology reflects the tendency to place extreme confidence in what technology can do without people's intervention. The author Kahn *et al.* (2014:302) further their argument by identifying the role played by IT in RDM sustainability:

- IT courses are not adequate in addressing the relevant issues, such as expansion and software skills (or without producing enough graduates to satisfy demand).
- There is a lacking increase for information management skills in RDM, with the view that IT skills are more important; and
- The high petition for growth and software skills that are in demand for the market involves with these skills, are faster than they are manufactured, yet the demand for information management skills is less (Kahn et al., 2014:302).

Cox and Verbaan (2016:320) raised a concern with the IT services lacking a strong focus when it comes to supporting initiatives, such as RDM. Kahn et al. (2014:300) highlighted further concerns as they feel that ICT should play a prominent part in RDM, and curation as the hindering gap in RDM services. In support of this argument Chawinga and Zinn (2020:8) shared a sentiment raised by Cox and Verbaan by affirming that poor RDM infrastructure and deficiency leads to staff not being able to render this service to users. They further indicate that the library and IT largely more depend on professional services providers, in which exploration should form one client service provider (Cox & Verbaan, 2016: 320). Furthermore, the disconnection needs to be reinforced by having specialist in-front facing teams in IT services, while

personnel working on main infrastructure services, had no straight contacts with clientele.

The IT infrastructure plays a central part in promoting elevated policy agendas, such as open access in higher institution, as well as an increased exposure to exploration, yet changing views gradually through regular practices and encounters (Cox & Verbaan, 2016: 324). Goben and Griffin (2019:913) mentioned the importance of length and cost as infrastructure, as well as support needed to perform any RDM service in higher institutions. Kahn et al. (2014:302) further stress that the scarcity of understanding the proficiencies of technological mandates of ICT departments, as well as fear of new technology may lead to a reluctance in adopting new technologies. Ng'eno and Mutula (2018:35) stated that ICT infrastructure such as web portals, institutional repositories, networks, hardware, and software for RDM were not fully developed to facilitate the full operationalization of RDM. Akers et al. (2014:185) stated that the conception of new library services that support exploration and RDM, frequently needs personnel who own specific skill sets or knowledge bases.

2.6 Marketing strategies of RDM services

Awareness is critical in RDM deployment. Cox and Pinfield (2014) documented the important part of promoting RDM awareness by Librarians in facilitating the use of RDM. Grynoch (2016:1) quoted Britney, stating that information specialist can play a vibrant part in helping institutions in creating a data policy and stimulate the amendment of data policies that are detrimental to exploration. There is a different sentiment about the idea of information specialists as role players in the advocacy of RDM.

Contradictory, Chawinga and Zinn (2020:3) raised the issue of lacking RDM abilities amongst Librarians as a huge attribution to limited specialized growth in opportunities that would give Librarians the necessary skills-set to subdivide successfully into technical RDM services. Several readings have also testified to a lack of RDM skills midst Librarians (Chiwere & Mathe 2015, Cox et al., 2014). Grynoch (2016:4) noted the solution to the Librarians' knowledge of RDM. Furthermore, Grynoch (2016:5) state that Librarians must understand what exploration is performed at the institution and what terms are related to that field of exploration, concerning data. Besides policies, library staff in RDM also plays an imperative role in marketing RDM services in the

institutions as they have better understanding than Librarians do. Grynoch (2016:10) encapsulates that RD managers of libraries need to become open data promoters and the spokes-persona for advancing data management standards, skills, and education. Some of the studies acknowledge the important role played by the Librarians in promoting RDM. Chawinga and Zinn (2020:7) in their discussion, acknowledge Librarians in their substantial movement in availing and advocating the concept of Open Access (OA) and also contend that professionals at the universities could be better following the same suit with the perception of RDM and sharing data. This may involve the conduct of persuasiveness and promoting events involving the channels and benefits of sharing data (Chawinga & Zinn, 2020:7).

ACRL (2015:10), as well as Chiware and Backer (2018) further state the importance of libraries in partaking in developing outreach and educational efforts with an innovative eye in implementing new services, such as RDM.

In addition, Bhojaraju and Panorea (2017:10) indicated other ground-breaking ways to raise awareness of RDM, through using social media and highlighting the significance of RDM across the globe. Similarly, Kumbhar (2014:478) mentions that libraries are making use of different platforms, such as YouTube for reaching out to their patrons, which results in an increase in viewership. The usage of the social media environment in creating the awareness of services, is gaining a momentum in academic libraries. Investigators Boyce, Greenwood, Haworth, Hodgson, Jones, Marsh, Mawson and Sadler (2019:9) highlighted the power and the significance of social media in making a means for exploration to be well understandable by non-academic audiences.

Furthermore, Mushi, Pienaar and van Deventer (2020:6) add more strategies in creating awareness and supporting RDM practices, including internal distribution of articles through institutional repositories, websites, and conferences. In addition, these authors stress the importance of marketing library services at institutional meetings, training, and workshops (Mushi et al., 2020:6). In addition, Koopman and de Jager, (2016:6) highlighted tools that can add more value in marketing RDM, such as LibGuides, workshops and conferences to support exploration records' generators, while engaging broadly with targeted users. Si et al. (2019:296) also added the value of guides in promoting RDM services as it entails clear instructions that are easy to

follow. They (Mushi et al., 2020) further mention the supportive role those academic libraries provide through training, consultation services and developing data repositories that add visibility of exploration data (Mushi et al., 2020:4). Sewell and Kingsley (2017:151) suggest that embedding RDM within International Open Access Week can also be a beneficial way of marketing the service. Furthermore, training programmes such as International Open Access Week complement existing training with the intention to create client specific targeted programs (Sewell & Kingsley, 2017:151).

Meanwhile Brown, Wolski, and Richardson (2014:226) stated that raising awareness of data is a real issue within organizations and the benefits of actively supervising investigation data, is priceless. Creaser and Spezi (2014:36) add on by stating that promotion of new or existing services, database trials and general announcements on library websites, appear to be the most active means of collaboration with stakeholders.

According to Read et al. (2019:435) there are a variety of ways that institutions can embark on marketing RDM services, which include library events advertised on web pages; email alerts to departments, faculty, and staff; as well as promotional articles published in institutional newsletters or websites. These authors further mention that collaborating with other participants, such as the Office of Science and Research; Institutional Research offices; use of multimedia platforms within the library (i.e., plasma displays rotating announcements); and generating posters, can increase the viewership of the service. Read et al. (2019:437) alluded that outreach strategies such as RDM symposiums plays a vital role, as it creates an environment conducive for collaboration with the Institution's Research Office to ensure the success of such events. The importance of data series as a marketing tool, according to authors Read et al, (2019:439), effectively strengthens collaborations within and outside the library boundaries.

Cox and Verbaan (2016:325) applaud the vital roles that library staff can play in raising awareness and encouraging targeted users to participate in RDM training. These trainings provide academic Librarians with an opportunity to engage with their investigators, which promotes building working relationships and a better understanding of their exploration. Mushi *et al.* (2020:6) conclude that stakeholders of

academic institutions need to be knowledgeable about issues related to RDM. Communication plans are crucial when it comes to marketing the RDM service highlighted (Grynoch, 2016:9). The benefits of an effective communication plan, ensure that the institution maintains a consistent message, identifies the target audiences for RDM services, whilst effectively creating a RDM exploration guide that benefits all (Grynoch, 2019). Authors, Creaser and Spezi (2014:30) support the statement of Grynoch by adding that announcement plans promote the building of professional relationships between the library and individual faculty members and departments, by changing perceptions and at the same time providing value-added services. They emphasise publications with teaching and exploration staff, as well as the promotion of library services, which have a big effect on both levels of use and insights of value (Creaser & Spezi, 2014:30). Furthermore, Creaser and Spezi (2014:30) emphasise that personal relationships were established in numerous ways.

Grynoch (2016:9) also mentioned that RDM workshops designed for graduate students assist the library in marketing these services and ensures knowledge and appropriate use of RDM that is imparted during these sessions. The investigators Creaser and Spezi (2014:31), conclude that when faculty members attend these events, they are most likely to use social media to share their experiences of conferences and workshops on campuses, which further promote RDM services. The usage of Web 2.0 and social networking, according to Creaser and Spezi (2014:33), is not widely used, but could be beneficial in marketing and communication for libraries.

2.6.1 Barriers of marketing RDM services

Essentially, Creaser and Spezi (2014:32) highlight the disadvantages of not using social media and infer that traditional means of marketing, although being the preferred method to market services and facilities, could not reach all intended audiences (Creaser & Spezi 2014: 33). Some of the challenges raised by Creaser and Spezi are lack of confidence from Librarians to make use of social media tools, lack of understanding on how to use these tools, lack of self-assurance in Librarians for understanding investigators' needs, and seeing a faculty as independent in exploration, and these appear to be the main obstacles.

Chawinga and Zinn (2020:3) raised a number of other challenges in supporting Creaser and Spezi (2014:33) and to mention but a few, deficiencies of skills is one of the most noticeable challenges that obstruct RDM progress. Information specialists lack numerous RDM skills and knowledge. Lack of RDM skills amid information specialists, has been a huge attributer towards a few professional development opportunities, which would offer information specialists the necessary abilities to branch out successfully into technical RDM services. Technologies connect people across all spheres, irrespective of time and place as barriers.

2.7 Policies that supports RDM in Universities

Many academic institutions have tabulated policies that supports RDM in addressing various issues, such as intellectual property, ownership of the data and archiving, as well as reuse of the data. Piracha and Ameen (2019) mentioned that libraries presently have evolved in the development of new organisational RDM policies and services (Piracha & Ameen 2019:40). Many exploration organizations have established exploration data services in their libraries in response to funder policy, both internationally and locally, such as NRF in the South African context. Chiware and Mathe (2015:1) supported the notion by stating that in South Africa, some institutions are in the early stages of providing frameworks for RDM services with the accomplishment of policies being transcribed, set up of infrastructure, training of library personnel, and awareness and advocacy campaigns held with academia and investigators. On the other hand, Piracha and Ameen (2019:40) state that many Universities in the UK are still faced with the challenge of formulating RDM policies and the initiation of effective RDM services for their respective clients. Therefore, RDM services cannot be implemented without policies that supports its functionality. Furthermore, Piracha and Ameen (2019:40) proposed that the institutional library should take central stage in developing RDM policies that reflect recognitional priorities.

2.7.1 Local policies that supports RDM in Universities

In the South African context, according to Chiware (2020:402), the RDM environment, regarding early adopters in the higher education and exploration areas already implemented, include development of policies and guidelines on RDM that are in place. It is necessary to have a proper set up of library data infrastructures,

redistribution, and training of information specialist to offer RDM services, monitoring advocacy and promotional events, as well as responding to government initiatives to develop national data-intensive exploration infrastructures that are fully supported by responsive RDM services (Chiwara, 2020:402). Furthermore, Chiwara (2020:383) added that requirements from governments, funders, publishers, and scientific exploration communities, are also good RDM practices throughout the exploration life cycle and the exploration data are accessible as per the public mandate funding agency, such as NRF.

The study done by Chigwada, Chiparausha and Kasiroori (2017) discovered that there are a lack of policies and guidelines on RDM based budgetary constraints (human resources, technological infrastructure) and a lack of support from the management of the institutions regarding the deployment of RDM services. Even some of the South African leading institutions are not fully ready yet to adapt the mandate of deployment of RDM as per the study done by Chiwara and Becker (2018). In their study, Chiwara and Becker (2018), discovered that resources (such as infrastructure and human capacity) are the main challenges that they are faced with. Many studies also identify skills gaps amongst designated staff, even though they are implementing the RDM services (Chiwara & Mathe, 2015, Chiwanga & Zin, 2020).

2.7.2 International policies that supports RDM in Universities

RDM is a global matter, and all the institutions are faced with certain challenges in deploying the RDM service, irrespective of the region in the world. RDM services are developed at institutions in response to demands from funding agencies, and as part of the worldwide OA movement. National funding agencies in several countries now require investigators to prepare data management plans (DMPs) and to provide open access to data and scholarly publications (Matusiak & Sposito, 2017:1). Both local and international institutions commonly experienced the same sentiment when it comes to the skills gap of the Librarian (Cox et al., 2014, Cox & Verbaan 2016).

2.8 Role of policy and advocacy in RDM

Chiwara and Mathe (2015:3) point out that academic institutions already have existing policies or are formulating policies that determine the implementation of both a technical and supporting infrastructure of RDM, which include creating awareness and advocacy campaigns. Policies and advocacy of RDM are one of the main drivers in

enhancing the visibility and marketing of the service as a vital factor. In addition, technical infrastructure is vital in ensuring standards are adhered to, to implement RDM and ensure access to resources (Schirrwagen et al., 2019:2). The advocacy of a policy towards RDM has a major role to play as the director on implementation and promoting the service to the exploration community. In supporting the statement, Van Deventer and Pienaar (2015:44) mentioned that RDM openness is a great proficiency in developing high-level maintenance and obligation, increased from policymakers and infrastructures in developing support for RDM. The development of policy strategies and advocacy for RDM is a critical required activity for rational data service development. The RDM strategy and policy outline institutions' RDM opportunities, and intentions for the future, while obtaining strategic plans. The involvement of stakeholders in RDM, such as governments, funders, and academics, information specialist, IT specialists and ethics agencies, could be beneficial in the processes and requirements of creating policy frameworks while potentially creating awareness about RDM. Libraries should take a prominent part in RDM improvement through advocacy, promotion, and training of other RDM shareholders in universities and exploration organizations, especially about employing RD through access, use and reuse (Cox, Verbaan & Sen, 2012b). Advocacy for open sharing data adds value to the administration of an institutional DR, as well as data literacy amongst other matters that professionals and archivist should be taken into consideration (Cox et al., 2012b). Exploration organizations should attempt for RDM promotion that is needed at several phases of administration, investigators, and other stakeholders to share practices on RDM, as well as discuss current and forthcoming trials regarding the curation of data, distribution, OA, and DR, to mention but a few. Moreover, Kahn et al. (2014:297) suggest that in South Africa, promotion and ability structure through conferences, workshops and symposiums, encourage the growth of knowledge in this extent.

Kennan and Markauskaite (2015:70) mention that RDM faces challenges, which include insufficient funding; absence of RDM policies; insufficient support from institutional authorities; and insufficient technical support, which directly impacts exploration data output. Cox et al. (2017:2183) mentioned that advocacy is regarded as the most important aspect in RDM that contributes to changing the culture, while pro-actively promoting direct and indirect benefits of RDM services. Davis and Cross (2015:10) applaud Librarians with the knowledge, expertise, and role play in raising

awareness of data management plans, exploration practices and workflows. Furthermore, these authors highlight the role played by the Librarians in advocating policies and requirements with respect to data management and sharing, and sufficient knowledge about data repositories to support data management (Davis & Cross, 2015). Moreover, they stated the involvement of unpacking options for sharing data, understanding open access, navigating intellectual property rights, licensing of data collections, and adhering to publication requirements of journals (Davis & Cross, 2015).

Read et al. (2015:435) address some of the biggest problems experienced by different disciplines when it comes to data management and creation of a data management plans. Brown et al. (2015:225) mention policies and tactics that pave the way for the conception and institutional incorporation, while running support services for fundamental infrastructures.

2.9 Summary

The adoption of Lewis's (2010) RDM pyramid by the researcher, where pyramid narrates the advocacy of RDM services in libraries while emphasise the role played by libraries and information specialists as well as the integration of RDM within educational entry level in the schools of Library and Information Science and effectiveness in enhancing the national policy development.

The literature identifies numerous gaps within the chain of service delivery. Furthermore, authors(Creaser & Spezi ,2014; Chiwanga & Zinn,2020) also identifies gap in the upskilling of the Information Specialist as daunting effect in RDM service delivery. The infrastructure still the other aspect that is highlighted by authors (Chiwara & Mathe, 2015; Chiwara and Backer,2018) mentioned as the challenge in having sustainable RDM.

Academic libraries in the 21st century need to strongly market their services to move away from the traditional perception of the library containing only records and not existing any longer. Therefore, libraries should continuously make their product to be top-of-the-mind information sourcing organizations. The acknowledgement of the role played by professional librarians in marketing the services rendered by libraries. Further, the importance of increase in creating information alerts for the academic

libraries and significant support in assisting the not only research community but making sure of receiving recognisance of their emerging part in-depth and developing while re-shaping library services (Gupta, 2006:153). The staff recognise RD as an important part of the library infrastructure that needs to be in place for supporting investigators, however outcomes here indicate that libraries put in more time on advising and training of investigators (Gupta, 2006:153).

The role played by the policies in advocating the RDM is also highlighted as the important factor in the deployment of the effective and sustainable RDM services in the academic institution. Schirrwagen et al., (2019) acknowledges the sustainable technical infrastructure as the driver in implementing the effective RDM services .

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section takes the reader along the methodology used during the investigation. The methodology guides the design and serves as the foundation for the exploration's conceptual framework. Novikov and Novikov (2019:2) define methodology as the organization of organized activities to achieve the research project's objectives. Kumar and Pattanayak (2018:3) support the sentiment of Novikov and Novikov (2019) by stating that methodology is about how we practice our ways of knowing the world to gain more knowledge about the multiple realities. The authors (Novikov and Novikov 2019) further mentioned that research methodology deals with general commandments and principles of unifying the exploration activity by choosing an efficient (adequate, rational) investigating technique (Novikov & Novikov, 2019:3).

3.2 Research approach

Research methods are determined by two approaches, namely the inductive approach and the deductive approach. Both approaches involve building and testing of the theory. The exploration designs that are based on deductive rather than inductive logic, is flexible and emergent in nature, as well as non-linear and non-sequential in their operationalisation (Kumar, 2011:103). There are three commonly identified methodological approaches to research used in social research by various authors, namely qualitative, quantitative, and mixed methods (Ngulube, 2015:5; Creswell, 2014:32; Neuman, 2011:214; Creswell, 2006). Out of these three methods, the study adopted a quantitative research methodology. The intention of the investigator to use quantitative research methodology, was to explore the status-quo of the RDM and investigate marketing strategies employed by various institutions. Opting for a quantitative research approach for the study, was to focus on gathering numerical data and generalising it across a group of people, while explaining the effectiveness and importance of marketing services, as well as maximising the visibility of the new service to the targeted community. Kumar (2011:32) defines variance between qualitative and quantitative research methodology, where quantitative research is an organized approach to inquiry, and qualitative research is unstructured. Babbie

(2020:25) distinguished between qualitative and quantitative data, as well as non-numerical and numerical data. The primary distinction between qualitative and quantitative research is in the way the investigator frames the study questions and data gathering procedure. According to Kobus (2020:329), the quantitative method seeks correlations between variables, whereas the qualitative approach seeks an in-depth understanding of individual experiences.

Denzin and Lincon (2018:10) describe qualitative research as it entails a set of interpretative and practical material that consumes the visibility of the world. They further state that qualitative research involves an interpretative, naturalistic approach of the world. On the other hand, Kobus (2020:329) describes quantitative research as a systematic process and objectives that are captured in numerical data from an identified subgroup of the population to generalise the findings being studied. He further mentioned three important aspects of quantitative research as objectivity of the study, numerical data form and generalisability of the study (Kobus, 2020:184).

For this study, a systematic questionnaire with both closed and open-ended questions was employed. Babbie (2020:281) claimed that the questionnaire is appropriate for a specific targeted population of the research. Because it was less expensive and required less time, a questionnaire was utilized. As the world was in the grip of a pandemic, the questionnaire gives an added incentive for the investigator to select the research. Most importantly, a questionnaire was used to collect the information needed by the investigator to answer the research questions.

3.3 Research design

The historical dynamics of design research, according to Archer (2019:317), are based in educational research. Archer (2019:317) identified two separate functions for research design: as an intervention tool to solve issues being researched and as a set of design principles to familiarize with the execution of the intervention in various contexts. The study design is essential in defining the research's content validity and consistency. Sileyew (2019) advocates for research design intentions as components of an acceptable framework for a study. Furthermore, the research design process was the decision to be made about research strategy, since it influences how relevant information is obtained.

As a result, Creswell (2014:3) described research design as strategies and processes that govern the whole activity, beginning with assumptions and progressing to methods and instruments for data collection, analysis, and explanation. Kumar (2011:95) expands on Creswell's (2014) definition by adding that research design is a procedural strategy used by the investigator to respond to the interrogations in a legitimate, objective, accurate, and cost-effective manner.

The investigator's goals in this study were to ask both closed and open-ended questions from the participants to obtain more relevant information from them. The study approach allowed the investigators to collect data from a diverse set of respondents. Given the demographic, sample size, and time constraints, the investigator was determined that the survey method (online questionnaires and document collection) was an excellent choice for this study. The questionnaire survey was acceptable, because of its large-scale applicability, capacity to achieve good response rates, and ability to allow the investigator to examine the respondents' attitude, amongst other benefits.

3.4 Population of study

Investigators are generally tasked with drawing conclusive findings about big groups, based on a sample size. According to Leedy and Ormrod (2020:114), most of the data are collected on the premise of a certain generalized population that can form the population of the research. A sample is a small subset of the Population that is thought to be representative of the entire population. Patten and Newhart (2018:109) debate the significance of population sampling in quantitative research, arguing that statistics allow investigators to detect forms in data and generalize findings from a sample to a population. The availability of resources determines the appropriate sample size (Bloomberg & Volpe, 2012:104)

The study's population was drawn from the following Universities: University of Cape Town (UCT), the University of Stellenbosch (SUN), the University of Pretoria (UP), the University of Johannesburg (UJ), and the University of the Witwatersrand (WITS). The participants were recruited from the academic libraries of the above specified Universities. The study's population 20 people, depending on the size of the institution's personnel. The emphasis was on the individuals, such as research data

managers, research data supporting staff, academic Librarians, Information and Communication Technology Library (ICTL), and the library's marketing team, who are the authorized RDM service providers.

3.5 Sampling of the study

According to Patten and Newhart (2018:110) a sample needs to be large enough to sufficiently signify the population and its variability in the relevant areas of inquiry. In quantitative research the investigator attempts to select a sample in a way that is unbiased and signifies the population from where it is selected (Kumar, 2011:175). Often, an investigator draws a sample from the population of their interest in explaining or describing the intentions of the research project. Patten and Newhart (2018:89) state that development of sampling give investigators a chance to select a subset of the population that they are interested in and use analytical methods that allows the investigator to make inferences about the population.

There are different kinds of sampling procedures in exploration. These samplings are as follows: probability and non-probability sampling (Patten & Newhart, 2018:87). Patten and Newhart (2018:87) argue that probability-based sampling procedures are commonly associated with the studies that will analyze the data using statistical methods. They further the argument the non-probability is used in qualitative methods. Patten and Newhart (2018:72) alluded that the sampling of population is imperative in quantitative research, because of the impracticality to include the entire population in a research project. They further emphasize the scrutinizing of quantitative data samples, using statistics (Patten & Newhart, 2018:72).

The study's sample was limited to five research data managers from chosen Universities, five research data supporting personnel, five academic Librarians, five ICTLs, and the library's marketing team. The overall number of participants in the study were limited to 20, depending on the staff complement of various institutions. The RDM recently created entities inside Librarians with a significant personnel complement. Purposive sampling was utilized in the study. Purpose sampling is a sampling approach used in exceptional situations when sampling is done with specific goals in mind (Kobus & Pietersen, 2020:220). Purposive sampling aided the investigator with the study's sample as the exploration was focused. The key consideration in purposive

sampling, according to Kumar (2011:189), is based on investigators' judgments on how best to acquire information to meet the study's aims.

Purposive sampling, according to Gournelos, Hammonds, and Wilson (2019:122), occurs when the investigator intentionally determines which persons will provide relevant replies linked to the study endeavor. Kumar (2011:177) also mentioned some of the benefits, such as saving time, money, and human resources. The downside, according to Kumar (2011), is that the investigator does not conduct a background check on the characteristics of the population that interest the investigator, but rather estimates or predicts them. Furthermore, sampling is a trade-off between many compensations and weaknesses. On the one hand, investigators save time and money, but on the other, they may have concession of the level of accuracy in the verdicts.

3.5.1 Sample design

Before any data is gathered for the purpose of obtaining a sample from a specific population, a selection plan is determined (Jagdale, Hude & Chabukswar, 2019:569). For the study the selected sample was based on the participants that closely with or within RDM service. According to Kothari and Garg, the sample design refers to the strategies and procedures used by the investigator in selecting the study's sample (Kothari & Garg, 2014:52).

Before collecting data, the sample design must be chosen. The investigator is the one who decides how to construct the study's sample, based on the subject under investigation. The sample that was selected for the study were research data managers, research data supporting staff, research data librarians Information and Communication Technology Library (ICTL), and the library's marketing team that are hands on the RDM service delivery.

3.5.2 Sample size

Kobus (2020) highlights the importance of sampling in a study. The author's argument stated that designing the sample impacts the sample size and sample type of the study (2020:93). According to Patten and Newhart (2018:110), the determined sample size must be identified by the smallest number of people required to represent the population well, while producing useful results that are subjected to statistical analysis. The size of the study was project to be 15 participants and as newly service of the

library is not yet well capacitated by staff complement. Cohen, Manion and Morrison (2018:204) supported the notion raised by Patten and Newhart (2018), by highlighting that trial size is also determined to some extent by the style of the investigation. For instance, investigators constantly conduct pilot studies, which are designed to obtain pre-liminary evidence on how new treatments and measures work (Patten & Newhart, 2018:123).

Furthermore, Creswell (2020:173) underlined the significance of establishing the size of the sample required for investigators and highlighted the significance of the basic rule of thumb of selecting as big a sample from the population as feasible (Creswell, 2020:173). In addition, Kobus (2020:221) stressed the importance of sample size in achieving a particular level of accuracy when evaluating statistical data. Moreover, the larger the sample size, the better the representativeness, statistical analysis, and data correctness (Kobus, 2020:221).

3.6 Data collection

According to Gournelos, Hammonds and Wilson (2019:133), most surveys are conducted online, since they can be quickly developed, altered, shared, and adjusted as needed. It is also important to highlight that it enables inclusion of multimedia material or even dialogues amongst participants (Gournelos, et al., 2019:133). This study was carried out using online Google form questionnaires and the link was shared via respective email address. The investigator was unable to do a face-to-face interview, because of the health conditions (Covid19). As a result, the research was conducted and the data was collected via online platforms using Google forms as well institutional websites, while adhering to pandemic laws and regulations.

According to Cohen, Manion and Morrison (2018:471), questionnaires are regularly and widely utilized, and they are considered as a good device for gathering survey information and delivering structured feedback. It is also stated that numerical data are commonly connected and are simply given without the investigator's physical presence; it is also very straightforward to evaluate (Cohen et al., 2018:471). According to Flick (2015:134), one of the hallmarks of questionnaires are thorough standardisation and the goal of getting comparable responses from participants. Furthermore, Flick (2015) referred to the fact that inquiries and data collecting scenarios are decentralized.

A maximum of 15 participants was chosen for this study to uncover the influence of RDM marketing strategies on the sustainability of RDM services. As a result, quantitative data was suitable for study, since the investigator's goal was to collect data that would render reliable and unbiased evidence that could be repeated for future research. The online survey and institutional websites aided the investigator in tracing and uncovering which marketing strategies were used by the selected institutions, as well as gaining a broader perspective on the efficacy of their marketing strategies.

3.6.1 Overview of data collection instrument

This study's research tool was an online Google form which is an electronically accessible questionnaire, and the link was distributed through email. Based on the basic research questions and an assessment of related studies, the questionnaire was self-developed by the researcher using commonly understandable language which is English. Because English is the language used by all the organizations under investigation, and it was well understood, given the educational level of the contributors under investigation. According to Gournelos et al. (2019:124), open-ended questions in a questionnaire allow participants to explain their opinions and experiences in depth, whereas closed-ended questions limit replies to a categorical topic. The survey consisted of both closed and open-ended questionnaires.

Furthermore, Gournelos et al. (2019) said that in both situations, the investigator is determined to attach experience or views into established common attitudes, opinions, labels, or categories. The questionnaire testing also aided in the elimination of problems, such as screen display specifications, easily access of the link, questionnaire content and functionality, and standard questionnaire platform (software). The test was successfully and thereafter link was distributed.

3.6.1.1 Questionnaires

A questionnaire is a research tool that entails a set of questions with the intention of capturing responses from intended participants in a consistent manner. The questionnaire was self-developed by the researcher and the researcher received the approval of the questionnaires from the institution and the study leader. Questions of the research were both unstructured and structured. Unstructured questions asked

contributors to offer responses in their own words, while structured questions asked contributors to select a reply from a given set of choices. Kobus (2020:203) identified both advantages and disadvantages of using open questions when the investigator set up the questionnaire. Some of the identified advantages were as follows: respondents could give honest, detailed answers; questions can be adequately answered; and extremely important information can be gathered through the answers. The investigator identified different categories and subcategories. On the disadvantage side, Kobus (2020) noted that the amount of detail can differ from respondents, coding and statistical analysis can be challenging for the investigator, and lastly, time may be needed by the respondent to think and write the necessary answer to the question asked by the investigator (Kobus, 2020:202). At the same time, Kobus (2020) argues that close questions are simple and straight-forward as the respondent only chooses one or more answers from the provided list by the investigator (Kobus, 2020:202).

According to Cohen et al. (2018:471), questionnaires have the advantages of standardized and open replies from a large sample or population on a variety of topics. Furthermore, surveys are inexpensive, dependable, valid, fast, and simple for participants to complete. (Cohen et al., 2018:471). This technology allowed the investigator to acquire a large amount of information in a short period of time and at a low cost. Pre-coded close-ended surveys were utilized to facilitate a quick procedure, but open-ended portions allowed respondents to offer opinions that the investigator had not previously expected.

Web-based surveys are relatively new, but they are quickly becoming the methodology of choice for the most discerning investigator. With the Covid 19 pandemic, web-based questionnaires assisted in eliminating health-related risks. Distributing an e-mail with a link that directs one to pledge, secured a website to fill in a questionnaire, as well as Ms Word that was attached to eliminate any challenge with the opening of the link. This sort of inquiry was typically rapid, easy, and involved less intimidation of the contributors on the part of the investigator. Questionnaires have both advantages and disadvantages.

3.7. Data analysis

The data was exported into CSV file, which is an Excel spreadsheet for analysis of data. The investigator opted for the up-to-date version of SPSS for cleaning up the data and to eliminate the level of human error. It also benefited from matching data sets and deliberation notes on a variety of data sets. The purpose of this study was to uncover the effect of the existence and marketing strategies, employed by academic institutions. The statistical tool was used by the instructor is descriptive statistics. Descriptive statistics is labelled as a shared name for diverse statistical methods that can be used to unify and recapitulate data in a meaningful way (Pietersen & Maree, 2020:226).

A typical code was formulated for discrepancies and unanswered questions were checked to ensure data precision before analysis and interpretation. A data reduction/cleaning tactic was employed to recapitulate the evidence composed, through occurrence analysis. This was completed to filter out unacceptable or spoilt questionnaires and measure central predispositions to draw irrefutable conclusions from the data. Comparisons and presentation of the data were completed by means of graphs and descriptive statistics, which entail the description and brief of data attained from a gathering of single units of investigation.

3.7.1 Descriptive analysis

As a statistical research enquiry, it needs to be analysed, and the analysis of this exploration will be descriptive data analysis. Connaway and Radford (2017:183) argue that upon readiness of data to be analysed, the investigator needs to identify which analysis to use between descriptive statistics, inferential statistics, or both. According to Cohen et al. (2018:727), descriptive statistics are self-explanatory as they pronounce and present data in terms of summary regularities.

Connaway and Radford (2017) add to Cohen *et al.*'s (2018) notion by stating that statistical analysis indicates how many people, objects, scores, or whatever achieved each value for every variable that was measured. These authors further argue that statistical analysis is a common type when it comes to frequency distributions, such as simple or absolute, cumulative, percentage, and grouped distributions. (Connaway & Radford, 2017:183). Additionally, Cohen *et al.* (2018:725) added that quantitative

data analysis has no superior or inferior importance over qualitative analysis and vice versa.

3.7.1.1 Data coding

According to Denzin and Lincoln (2018), coding of data means taking data apart and defining how it was established. Cohen *et al.* (2007:109) defined coding as the procedures of altering data into numeric format. Babbie (2016:413) mentioned two basic approaches that are associated with the data coding process, namely: beginning with a relatively well-developed coding scheme, and generating codes from data. Data coding can be developed prior to the collection of data. Kobus (2020:136) also added that codes act as a collection point for significant data while enabling the investigator to quickly retrieve and collect all the relevant data for analysis. Denzin and Lincoln (2018) add to Kobus' (2020) emphasis on coding, stating that when the investigator is busy with coding, they need to take into consideration short codes, simpler, more precise, and active as typically close to the date (Denzin & Lincoln, 2018:425).

3.7.1.2 Data entry

The data must be numerically coded after it has been coded. According to Babbie (2016:416), data input occurs throughout the data collecting phase. According to Babbie (2016), data entry professionals next put the data into specialized software, such as an SPSS matrix or an Excel spreadsheet (Babbie, 2016:416). These applications, nevertheless, save data in their own native format, which makes it difficult to exchange that data with other statistical programs at times. These systems, like SPSS, do, nevertheless, aid in the reduction of human mistakes. It also aids in the comparison of data sets when different arrays of the data sets are considered. For discrepancies and unpredictability, a standard was developed.

3.8 Reliability of data collection

According to Patten and Newhart (2018:141), dependability is defined as the method of measuring research and the consistency of various components of measurement. Kahwati and Kane (2020:203) define validity as a conclusion based on an analysis with the least amount of systematic bias. The dependability of data collecting is critical in research projects, since it validates the responses that must be confirmed. Cohen *et al.* (2018:774) identified two primary types of dependability in quantitative analysis

that play critical roles in evaluating steadfastness and are both indicators of internal consistency: the split-half technique and the alpha coefficient.

3.8.1 Validity of data collection

According to Patten and Newhart (2018:137), validity is seen as more essential than dependability. Furthermore, Patten and Newhart (2018) say that for validity to be helpful, a measure must be both valid and reasonably dependable. A brief pilot examination was conducted to ensure that the survey equipment was acceptable for the purpose for which it was designed. Different measures were established for the various conceptions being investigated for this study: tangible and quantifiable variables were found for each of the abstract components. External validity was verified by demonstrating that results are generalizable to a broader population.

3.9 Evaluation of the research methodology

Any research technique is certain to encounter difficulties, and the study was no exception. The main difficulty faced during the study was during the data gathering stage. The main issue was the inactive response rate of the study's chosen respondents. The response rate was very low and the institutional rules were also contributing factors in such a way some of the organization did not grant the permission for the study.

3.10 Ethical consideration

The function of ethics in research was to guarantee that the research was justified and did not endanger the participants. Archer (2019:327) additionally emphasizes that ethics retain specific positions that must be acknowledged as necessary tick-box features, linked to the study's endeavor. Non-harmful processes, informed consent, parental consent, assent, incentives, deception, anonymity, secrecy, misbehavior, conflict of interest, data quality, and data storage were also conversed (Archer, 2019:327).

The investigator recognized ethical issues and considered unethical conduct. Cohen et al. (2018:111) said that ethical research problems, such as what investigators should and should not do in their research and research behaviour, must be addressed. Ethical consideration does not convict the investigator to unethical

behaviour; rather, it binds the investigator to make good ethical decisions within the context of socially, politically, institutionally, culturally, and personally relevant contexts, and each piece of research raises ethical issues and dilemmas for the investigator (Cohen et al., 2018:111).

Ethical values vary around the globe, and what is adequate in one culture, may not be acceptable in another. Ethical concerns are not a one-size-fits-all matter that can be resolute before the investigation commences or when the project is acquiesced to an ethics committee. Respect for the person's preparedness to engage must be founded on complete voluntary eagerness and a thorough understanding of what is entailed. The study adhered to the University of South Africa's research ethics policy 2016, which includes the values of respecting autonomy regarding the POPIA act, rights, and dignity of investigation contributors, promoting benevolence, and protecting against causing harm to the research participants. The investigator always honoured the contributors' right to dignity, consent, privacy, and confidentiality. Contributors were guaranteed of their privacy and anonymity both before and after the study procedure.

3.10.1 Privacy and confidentiality

The respondents were made aware that they were under no obligation to reveal information that they considered personal to them. Babbie (2020:25) emphasizes the significance of participant anonymity and confidentiality during the study process. The investigator also agreed with the contributors that the information they gave would not be shared with a third party without their permission. According to Cohen et al. (2018:128), discretion is a primal value for a basic human need that is seen as the right to self-determination and overrides utilitarian considerations. Creswell (2020:175) emphasized the significance of protecting the privacy and confidentiality of those who engage in the study. In contrast to early research in education and the social sciences, today's investigators are concerned about the possible harm that participants may suffer because of research (Creswell, 2020:175.) This investigation was created in accordance with the UNISA ethical policy, as stated in the ethical clearance form.

3.10.2 Informed consent

To endorse informed accord, contributors were sufficiently informed about the protocols of the research in which they were requested to participate. According to

Creswell (2020:176), an informed accord form is a statement that contributors sign before participating in the research. This declaration should plainly state that the investigator will guarantee participants certain rights and that by agreeing to participate in the investigation, they acknowledge the protection of their rights. The investigator informed respondents about the aim of the study, the expected time and process, the advantages of the participants, and the level of privacy and confidentiality.

Summary

The chapter discussed the research methodology, methods, design, data gathering techniques, and procedures used in this study. The quantitative research method was utilized. The study's data collecting tool was a questionnaire, which was delivered to a sample drawn from the public. Documents (institutional website) were also used as a data collection for the study.

Ethical consideration of each institution and the University of South Africa were adhered by the researcher. The research methodology assisted the researcher to collate the necessary data to be analysed on the following chapter which is data presentation and data analysis. The data presentation and data analysis are one of the core components of the study that represents the main aspect or present the main charisma of the research.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION OF RESULTS

4.1 Introduction

This chapter discusses the research findings and analyses of the study. The actual data collection technique will be briefly outlined first. The study's actual findings will next be presented, which will try to confirm or refute the study's assertions, as well as answer the research questions and support the study's aims. The main purpose of this investigation was to uncover how research data management is organised in selected South African Universities. This would aid in the development of marketing strategies that might assist academic institutions in improving RDM services, such as meeting the information needs of community members. The goal of the study was to see what effect marketing of RDM services has on academic institutions, in terms of maintaining the visibility of research data management.

In this chapter, the researcher discusses the study's outcomes, as well as research data management and marketing strategies. The research objectives were established at the start of the inquiry and were to be met using research questions in this study. In this study, the researcher focused on linking the investigation's findings to the previous literature or the models that drive the study. Data were acquired from academic Universities in South Africa, because the intended participants were RDM library professionals. The key respondents came from a few institutions, whereas the main respondents come from a few others. The information has been organised according to the study themes established and according to the descriptiveness of Chapter One. To help answer the research topic, the following research objectives and research questions were created:

1. Examine the types of RD in the selected Universities in South Africa.
2. Determine if the various types of RD in the selected Universities in South Africa are available.
3. Examine if the available types of RD in the selected Universities in South Africa are accessible.
4. Explore ICTs that could assist in managing RD in the selected Universities in South Africa

5. Compare strategies that could sustain the selected Universities in South Africa, regarding marketing RDM.
6. Determine policies that could support RDM in the selected Universities in South Africa.

The research question of the study:

1. Is RD services publicly accessible in selected Universities?
2. How is RD in the various South African Universities managed?
3. What is the ICT's role in assisting the Universities in South Africa in managing RD?
4. What strategies are implemented to determine the effectiveness of RDM in the selected Universities?
5. Are there any marketing strategies used in the selected Universities to sustain RDM services?
6. Which policies are in place to support RDM in the selected Universities?

4.2 Data collection

In this chapter, the outcomes of the research will be discussed, as it has been conducted from different academic institutions in South Africa. The questionnaire was distributed as a link with a backup Ms Word document to all selected Universities in South Africa, using institutional email addresses, in addressing the relevant targeted participants. Websites of the institutions were also used to collect relevant data for analysis. The findings from data acquired using data collection devices, such as a questionnaire with both closed and open-ended questions, are presented in this chapter.

The data collection method of the study was the quantitative method. As it was discussed in previous chapters of the study, the targeted population and sample were selected Universities in South Africa. Purposive sampling was used in this study, as explained in chapter three, and the researcher had the option to establish her own judgment when selecting individuals. Purposive sampling, on the other hand, permits the researcher to select the sample, based on his or her own judgment.

The original sample size was intended to be 20 people from selected academic institutions in South Africa, depending on the staff complement of designated

institutions. However, it was reduced to only one participant, who managed to partake in the study. Nevertheless, website data collection was implemented as a substitute for the needed data from the selected institutions. Purposive sampling is a non-probability sampling method in which the units to be observed are chosen depending on the researcher's judgement of which will be the most valuable (Babbie, 2016:187). Many academics advise that in a quantitative study, the sample size should not be so high that it detracts from the study's principal goal (Fakude, 2012:65).

The data were exported from Google form into a Microsoft Excel spreadsheet to be cleaned, before being exported to SPSS for analysis. Empty fields, out of range values, as well as duplicates in the data were removed during the cleaning process. To keep track of all entries in the spreadsheet, all records were first assigned an ID, using the "Fill series" functionality in Microsoft Excel. According to Nisbet, Miner and Yale (2017:62), data should be cleaned to get rid of inconsistencies in the elements of the data, which may result in poor data quality, thus hindering effective analysis.

The response rate of the study from the targeted Universities, was poor. There were no spoiled or unfilled questionnaires to be discarded.

4.3 Data collection instrument

The data were collected through a Google form and a survey (Research data management in Selected Universities in South Africa). The Google form included age, gender, and ethnic group, as well as designated institution questions, to establish demographic features of the participants. The medium of instructions of the study was encoded in English (see Appendix 5).

4.4 Data analysis

The data were collected and analysed by SPSS. Descriptive statistics were used to analyse the categorical and interval level data.

4.5 Reliability and validity testing

Reliability means assessing the degree to which an instrument of measure, in the case of this study, the questionnaire measures construct constantly over time, is without bias and free from error, (Sekaran & Bougie, 2009). The questionnaire was tested for

stability and consistency in measuring the variables to assist in assessing the goodness of measure and ensuring that the findings from the analysis were credible.

4.6 Presentation of results in accordance with the study objectives

Based on the preceding chapter, this section will go over the responses to the questionnaires that were given via Google form to various institutions in South Africa in detail. However, the response rate to the surveys did not meet the expectations set forth in the study's first chapter. Therefore, the investigator used supplementary ways by using available data from institutional websites for further data collection for the study. The researcher will tie the research's outcomes to the literature review in the analysis of the findings. The narration of the outcomes will begin with biographical information about the study and will be followed by themes where the researcher will tie the research's outcomes to the literature review in the analysis of the findings.

4.6.1 Response rate and participants' profile

Institutional response

The study targeted five academic institutions, namely University of Cape Town (UCT), University of Stellenbosch (SUN), University of Pretoria (UP), University of Johannesburg (UJ) and University of the Witwatersrand (WITS). The response was from only one academic institution, while the other institutions did not respond. Other institutions' rules and regulations do not allow external researchers to investigate their staff personnel. Irrespective of this challenge the researcher used documents analysis (website) that is publicly available to extract and assessed the relevant information for the completion of the study.

Division's staff capacity

The endorsement of the new service by the institution results into resurrecting the need to elevate the knowledge and skills of their persona in order to prepare them for embracement of the service. RDM service as a newly launched service in institutional libraries and Librarians are in the forefront of clientele service as providers (Chiwara & Mathe, 2015; Chiwanga & Zinn, 2020; Kahn et al., 2014). The study recognized this sentiment as it was raised by different authors that RDM is a newly added service in the paradigm of academic library service landscape, with the staff complement of institutions, as well-capacitated with service providers and these staff persona are

dedicated to co-ordinate excellent service delivery to the academic institution community, while excluding other collaborative staff such as ICT, marketing and information specialists of the institution. As it is noted on figure 2 of the study:

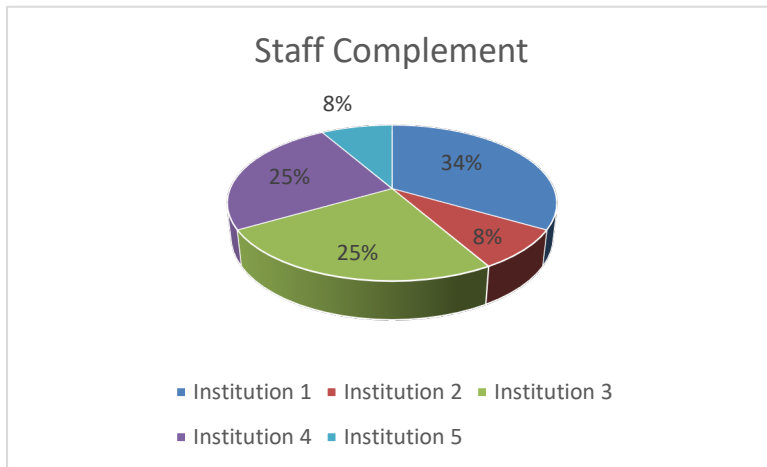


Figure 2: Staff complement

Based on the above figure the highest institution staff complement with the 34% is institution 1. Institution 3 and 4 have the same staff complement with 25% and other 2 institutions have 8% staff complement.

Demographic characteristics of respondent

The questionnaire was distributed in various institutions to gather information. The study followed the steps of the country in the ethnicity standards and based on that all the ethnical ratios were inclusively indicated on the survey. The domination of ethnicity on this study was also observed where whites took a lead compared to any other ethnicity.

It was also observed from the questionnaire's response for gender, that males were presented well with 100% and dominated in the study, while females were not presented in the study. However, on the institutional website it shows that female dominates the industry, as it demonstrated on Figure 3 below. It was noted from the two out of five institutions that females dominate the divisional unit, while only one institution that have a male, dominated in the divisional unit.

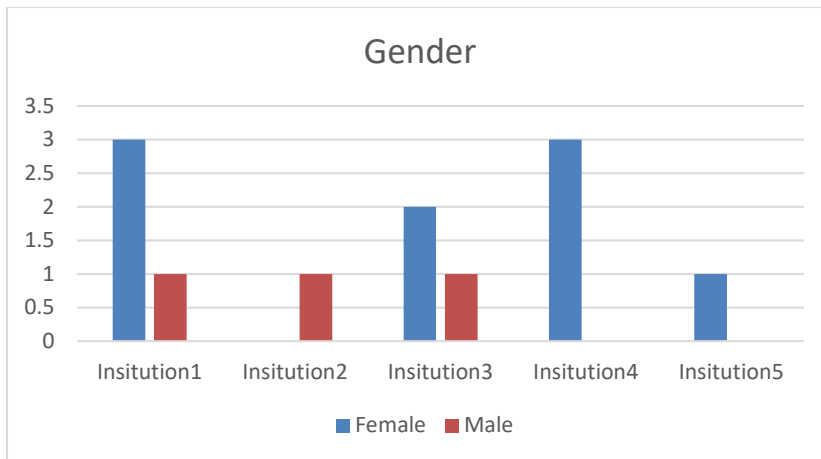


Figure 3: Gender

Number of years and designation

The respondents were asked to state number of years in their current job, as well as the role they play in their designated institution towards RDM. The respondents were well-versed in the RDM field and had five or more years of expertise in the RDM industry. The respondents were asked to indicate their designation as the study was targeting people who play an active role in the RDM service. The respondents indicated that they were in the managerial level of the RDM operational level. The researcher was also interested in determining whether the participants were actively involved in the operational of RDM. In the response the respondents indicated that they were actively involved in the operations of the RDM services. On the webpage, information was not easily to determine such personalised information as it is not publicly disclosed.

4.7 Data presentation research questions

This section of the study will analyse the open-ended questions of the survey in addressing the research questions of the study. These questions will be tie together to formulate the themes and will be linked to the literature review of the study. These

The research question of the study :

1. Is RD services publicly accessible in selected Universities?
2. How is RD in the various South African Universities managed?
3. What is the ICT's role in assisting the Universities in South Africa in managing RD?
4. What strategies are implemented to determine the effectiveness of RDM in the selected Universities?

5. Are there any marketing strategies used in the selected Universities to sustain RDM services?
6. Which policies are in place to support RDM in the selected Universities?

From the above research questions, the five themes were derived. The themes were tabulated as follows:

1. Types of RD in selected Universities in South Africa
2. Accessible types of RD in selected Universities in South Africa
3. ICTs assists in managing RD in selected Universities in South Africa
4. Strategies that sustain RDM in selected Universities in South Africa regarding marketing
5. Policies that support RDM in selected universities in South Africa

4.7.1 Types of RD in selected Universities in South Africa

There are three ways higher education can provide exploration data services. The first option is to develop an in-house institutional data repository (internal data repository, such as institutional data repository); the second option is to collaborate with external RDS providers and lastly pointing users to available and relevant data services. Meanwhile there are four types of publication repository institutions they may opt for when they are deploying the RDS, namely the subject-based repository, exploration repository, national repository system and institutional repository (Armbruster & Romary, 2010:62). The study indicated that the research and institutional repository is the most commonly adopted repository by South African Universities as it is shown in Figure 3 below. In some institutions they have links to a repository directory for the user to choose the most convenient one to their research project.

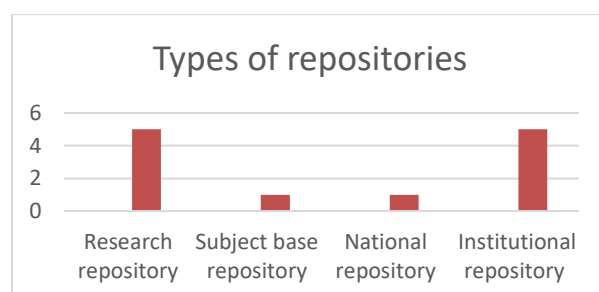


Figure 4:Types of repositories

4.7.2 Accessible types of RD in selected Universities in South Africa

It is crucial for the deposited data set to be easily accessible as it have an impact on mapping the through-put of the institution. Tripathi et al. (2017:417) argue about the importance of advocating exploration data that is uploaded into OA data repositories to be publicly accessible, browsing, and usable, as well as validating the reported exploration. The accessibility of the data also assists with the collaboration amongst academics. The study shows that the RD is publicly available to view the content and to view the content, however, for further engagement with the content, one needs to be a registered institutional member. All these institutions are using figshare as their repository access point. Each institution has a guide that assists with the step-by-step procedure for accessing and uploading the data on the system.

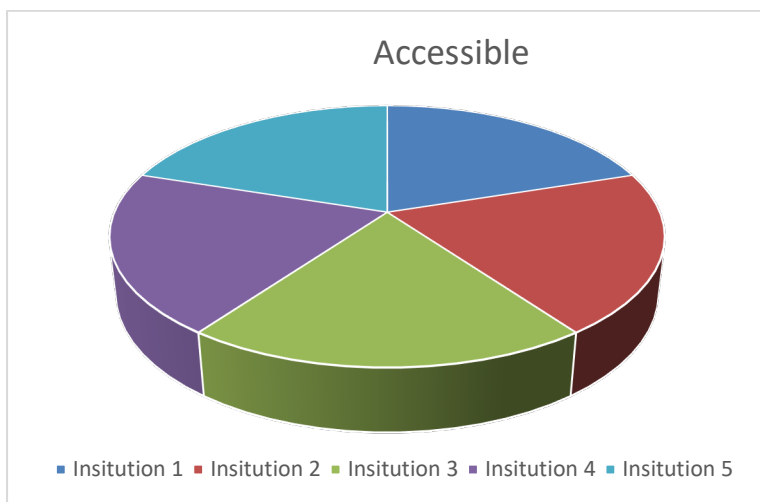


Figure 5:RD Accessibility

4.7.3 ICTs assists in managing RD in selected Universities in South Africa

Kahn et al. (2014:302) allude that the role and understanding of the role of technology, its mandate towards Information and Communication Technology (ICT) departments, plays a contributing factor in anxiety of new technology as it continuously leads to reluctance in challenging the resource. RDM challenges enhance new technology and emerging technology when it comes to capabilities of the technological revolution. ICT plays prominent role in RDMs' active procedure in supervising the exploration productions. (Cox & Pinfield, 2014:300). It is evident from the study that ICT plays a role as per institutional website where it shares the link to their ICT department for

further assistance, such as if one needs to request for a bigger data storage. Some of the institutions also shared procedures for applying for extra storage.

4.7.4 Strategies that sustain RDM in selected Universities in South Africa regarding marketing

ACRL (2015:10), as well as Chiware and Backer (2018), further state the importance of libraries in partaking in developing outreach and educational efforts with an innovative eye in implementing new services, such as RDM. Mushi, Pienaar and van Deventer (2020:6) add more strategies in creating awareness and supporting RDM practices, including internal distribution of articles through institutional repositories, websites, and conferences. In addition, these authors stress the importance of marketing library services at institutional meetings, training, and workshops (Mushi et al., 2020:6). The study indicated that all the identified institutions make use of LibGuides by 16% to share and market their RDM service to the targeted clientele.

The study indicates that 16% of institutions make use of LibCal to market their upcoming trainings and each training stipulates a targeted audience and also indicates whether the training will be online, face-to-face or hybrid. Each event on the calendar projects a number of seats that are available and occupied numbers for the training. 16% of the respondents of the study indicate that many institutions have an online presence on Facebook where they share information with wider viewers and these Facebook users are not only sharing RDM related information, but also share all the library services. 16 % of the respondents of the study indicates that most of the institutions have RDM dedicated services.

Twitter accounts only share RDM customised related information and services for the targeted clients. Instagram is not the most popular platform amongst the institutions as it has a 12% usage by the institutions to advertise their services to the clients. YouTube is another platform that is popular in academic libraries with 16% and it is used mostly to upload training videos for their clients. This platform is not only dedicated to RDM, but it used for every unit in the library that is producing the how-to videos to sell the service to their clients. In some institutions, it is used as a post-training platform to share recorded training sessions with the audience. Few institutions have a dedicated blog for RDM at only 9%. In some of the blogs,

information, such as institutional research papers about RDM are shared, as well as the conference presentations by staff members about RDM.

Newsletters and Wiki are not popular platforms for the marketing of the services amongst the library, as they both share 3% each. The newsletter has three issues per year and the information that is shared cuts across the library services. Wiki is continuously updated with the current information that is dedicated to RDM service delivery. Within the Wiki there is Google drive storage that is used to store MP4 videos of the trainings, as well as converted Ms PowerPoint slides of the trainings.



Figure 6: Marketing tools

4.7.5 Policies that support RDM in selected universities in South Africa.

Many exploration organizations have established exploration data services in their libraries in response to a funder policy, both internationally and locally, such as NRF in the South African context. RDM services developed at institutions in response to demands from funding agencies, and as part of the worldwide OA movement. National funding agencies in several countries now require investigators to prepare data management plans (DMPs) and to provide open access to data and scholarly publications (Matusiak & Sposito, 2017:1). This involve the options for sharing data, understanding open access, navigating intellectual property rights, licensing of data collections, and adhering to publication requirements of journals (Davis and Cross, 2015).

All participatory institutions adhered to the NRF mandate and have their policies in place. The RDM policies is very popular and it is well documented and some of the institutions are in a process of updating the policy. Intellectual Policy is also linked with the RDM policy to assist the functionality and sustainability of the RDM advocacy. Open access is amongst popular policies that substantiate the functionality of the RDM service advocacy. The POPIA Act is also well recognised as the key role player on the functionality of RDM as an added policy to round up the functionality of the RDM policy advocacy. The NRF statement as the mandatory of the deployment of the RDM on the institution, is also well documented amongst the drivers of the RDM services in all the identified academic institutions. Some of the institutions shared aligned international RDM policies that as an institution, adopted and replicated the smooth sailing of the endorsement of the policies. Some institutions have a faculty-based Memorandum of Understanding to enforce the adoption of RDM by the academia. Some of the institutions have DOI policy to support the functionality of RDM.

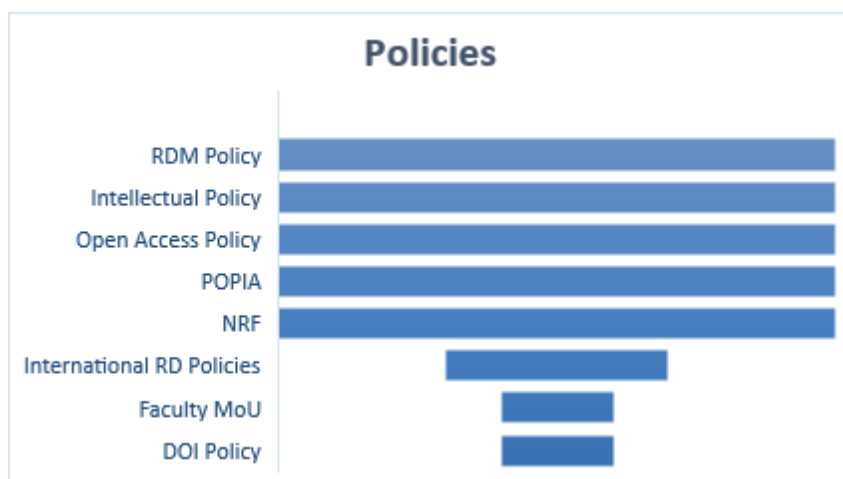


Figure 7:Policies

Summary

This chapter presented and analysed the results of the study related to RDM. The information was extracted from the webpages of each institution. The data presented shows the institutional commitment in serving its community demand and deployment of active RDM services. Some of the institution's staff complement of one personnel have been identified while some have four staff complement. All these institutional

repositories are publicly available to the community abroad the institutional membership. However, in order to actively interact with content, one need to have internal membership rights, but one have limited rights to access the content within the institutional repositories. Each institution has a standardise policies that clearly states chain of command of the RDM services within the institution.

The following chapter will discuss the findings in a details manner while answers the research questions and links it with the objectives of the study through themes that have been identified during the presentation and analysis of the data collected for the study.

CHAPTER FIVE

DISCUSSION OF THE FINDINGS INTRODUCTION

5.1 Introduction

This chapter discusses and interprets research findings which were outlined in the previous chapter. In discussing and interpreting research findings, the chapter comments on research data management in selected Universities in South Africa

In this chapter, the researcher discusses the study's conclusions, as well as research data management and marketing strategies. The research objectives were established at the start of the inquiry and were to be met using research questions in this study. In this study, the researcher focuses on linking the investigation's findings to the previous literature or the models that drive the study. Data were acquired from academic Universities in South Africa, because the intended participants were RDM library professionals and the webpages of the institutions.

The information has been organised according to the study themes and established according to the descriptiveness of Chapter One. To help answer the research topic, the following 6 research objectives were drawn:

1. Examine the types of RD in the selected Universities in South Africa.
2. Determine if the various types of RD in the selected Universities in South Africa are available.
3. Examine if the available types of RD in the selected Universities in South Africa are accessible.
4. Explore ICTs that could assist in managing RD in the selected Universities in South Africa
5. Compare strategies that could sustain the selected Universities in South Africa, regarding marketing RDM.
6. Determine policies that could support RDM in the selected Universities in South Africa.

And the 5 themes were derived from the objectives and research questions in the quest to answer the component of the study:

1. Types of RD in selected Universities in South Africa

2. Accessible types of RD in selected Universities in South Africa
3. ICTs assists in managing RD in selected Universities in South Africa
4. Strategies that sustain RDM in selected Universities in South Africa regarding marketing
5. Policies that support RDM in selected universities in South Africa

5.2 Types of RD services that are available

Pampel, Vierkant, Scholze, Bertelmann, Kindling, Klump, Goebelbecker, Gundlach, Schirmbacher and Dierolf (2013:1) state that data repository resumed in 2012 to index registered RD repositories for investigators, institutional funding, libraries, and producers to outline the heterogeneous exploration data repository landscape. There are three ways higher education can provide exploration data services.

The first option is to develop an in-house institutional data repository (internal data repository, such as institutional data repository); the second option is to collaborate with external RDS providers and lastly, pointing users to available and relevant data services. Meanwhile, there are four types of publication repository institutions they may opt for when they are deploying the RDS, namely the subject-based repository, exploration repository, national repository system and institutional repository (Armbruster & Romary, 2010:62).

For the purpose of doing a review of the types of RD that exist in selected Universities, the study's findings established the widespread presence of repositories in South African institutions. The most frequently identified repositories were the research repository and the institutional repository. Additionally, these repositories were within easy reach of these Universities' public domains and are the most often mentioned repositories.

The study's findings corroborate those of Armbruster and Romary (2010), who discovered the number of repositories in the index of registered RD repositories. Some of the institutions also shares the RD repository directory for giving a wider choice to their clientele and to assist as per recommendation of the funders for the clients.

The findings also correlated to the proposed pyramid by Lewis (2010), which consists of nine elements, as each element plays a significant role in functionality of the

effectiveness of RDM. With the first element of the pyramid, the findings of the study testified on the developing library workforce's data confidence where the finding narrated and capacitated the unity with specialists to deliver excellent service delivery to the targeted clientele. This was further attested by the findings with the collaborative effort with the relevant major stakeholders, such as the ICT department in enhancing service delivery.

5.3 Accessible types of RD in selected Universities in South Africa

RDM plays a vital role in enhancing an institution's academic profile and ranking within the higher education landscape. RDM ensures that an academic institution complies with standards that promotes the storage, preservation and sharing of data collected during the exploration process (Schirrwagen et al., 2019:2). Academic libraries have a vital part in marketing the use of RDM, as effective application of RDM will influence the academic profile of the institution. The support structure of the RDM services plays a key role in the pro-activity of effectiveness of RDM in the in higher education (Chiwane & Mathe, 2015:3).

The study's findings suggest that some institutions have access to the following repositories: subject-based repository; research repository; national repository; and institutional repository. Institutional research repositories and research data repositories are the most prevalent in South Africa as it is shown by the findings of the study.

The study's findings reinforce Schirrwagen et al.'s (2019) projections on the assurance of RDM standards compliance by academic institutions in diverse South African Universities.

The findings further connect with Lewi's pyramid where he stated that data must be conveyed into undergraduate exploration-based learning. The findings indicated that some of the institutions reinforce RDM, not only on postgraduate level, but undergraduates are also inclusive to lubricate them into early research careers. The findings further showcased the involvement of academic libraries in reinforcing Lewis's pyramid projection where he stated that libraries provide exploration data advice and teach data literacy to postgraduates. Through the finding of this exploration, it has indicated that libraries indeed do advise and train users in RDM. Furthermore, the

libraries do direct the flow to other repositories that are available specialised subject field of the community interest.

Huang, Cox and Sbaffi (2020:4) highlighted the role played by the documentation that contains instructions on how to access the datasets from the findings of the study. They confirm this sentiment by Huang et al. (2020), through an institutional YouTube platform in the how-to training videos that are shared, as well as the MP4 videos in the Wiki where it takes the user step-by-step on how to access and upload documents on the figshare platform in RDM. Meanwhile Si et al. (2019:296) emphasise the importance of guides as an access point and instructional documents that assist in meeting the investigators' needs. It is crucial for the deposited data set to be easily accessible, as it has an impact on mapping the through-put of the institution. According to the study's findings, the identified repositories are available to their clients with detailed information that is commonly needed by the user to be functionally used and understood on why RDM is important for their research projects.

As Si et al. (2019) emphasize the importance of accessibility to repositories, the outcomes of the study also support the literature review on accessibility, as it plays a critical role in mapping the institutions' ratings. In contrast, Haung et al. (2020) discovered that lacking marketing and knowledge about RDM, result in a reluctance of exploration to partake on depositing and granting access to their exploration data (Haung et al., 2020:8). The study's findings further confirm Haung et al.'s (2020) assertion that the lack of marketing and information sharing is due to institutional reluctance to collaborate, as there are virtually no gaps in service provision in terms of motivation and willingness.

The finding of the study confirms Lew's pyramid when he concurs with the development of investigator data awareness as the institution invests in different platforms to reach out to the investigators and in sharing all the necessary information to the users.

5.4 ICTs assists in managing RD in selected Universities in South Africa

RDM challenges enhance new technology and emerging technology when it comes to the capabilities of the technological revolution. ICT plays a prominent role in RDM active procedures in supervising the exploration productions. Cox and Pinfield

(2014:300) acknowledge accomplishments that contextualise issues, such as practical proficiencies, ethical concerns, legitimate matters, and control frameworks as primarily shapes of RDM practices and support within various institutional context. The investigator posed the open-end question to the participants regarding the ICT support toward the operation of the RDM in their institutions.

The study's findings corroborate those of Cox and Pinfield (2014), who emphasize the critical role of ICT in the formation and functioning of RDM. Additionally, the study's findings highlight certain critical essential roles that ICT plays as a critical partner and typically provides the critical basic layer of technology - internet access, data security, and storage, for example. The findings of this study corroborate Ng'eno and Mutula's (2018) assertion that RDM's ICT infrastructure, including online portals, institutional repositories, networks, hardware, and software, have been sufficiently established to enable full operationalization. Additionally, the data corroborate Cox and Verbaan's (2016) assertion that while libraries and IT are primarily autonomous professional service providers, these departments should collaborate to enable RDM functioning.

The study's findings, as well as the literature, demonstrate the crucial significance of ICT and libraries in guaranteeing the continuity of RDM services in academic institutions. These unified relationships demonstrate the importance of understanding how one's job is executed and how the success of the service is contingent upon their proactive role being played. Additionally, the findings confirm that the advice provided by ICTs on certain sites, is influenced by interactions on data sharing, privacy, security, storage, planning, and preservation.

5.5 Strategies that sustain RDM in selected Universities in South Africa regarding marketing

Awareness is critical in RDM deployment. Cox and Pinfield (2014) documented the important part promoting RDM awareness by Librarians in facilitating the use of RDM. The researcher, in the quest to seek the answers for the investigation, asked open-ended question to the participants. The question was about marketing strategies they use in their institutions. The study's findings do not contradict Cox and Pinfield's (2014) assertions about the importance of activeness, but it emphasizes the importance of managers of RDM being inclusive in marketing the service and raising awareness that

they cannot rely entirely on library marketing but must take an active role in sourcing the necessary information to distribute.

The study's findings also identified other effective marketing strategies and key individuals involved in increasing awareness of RDM services within the academic institution. Role actors, such as (Community of Practice) data stewards and champions serve as the foundation for implementing a successful marketing strategy and are the primary drivers of awareness. Furthermore, the finding exhibits different platforms that are utilised by academic institutions in creating awareness and advocacy of RDM services to the targeted clientele.

Chawinga and Zinn (2020:7) applaud Librarians for their significant efforts in advancing and advocating for the notion of Open Access (OA) and argue that university professionals should do a better job of following suit with their perceptions of RDM and data sharing. This may include the organization of persuasive and promotional events that highlight the channels and benefits of data sharing (Chawinga & Zinn, 2020:7). The study's findings also concur with Chawinga and Zinn's (2020) endorsement of hosting institutions, sponsoring an Open Data Day at the beginning of each year as a means of promoting the RDM service within the institutions. The findings further emphasize the importance of hosting Open Access Week as a marketing strategy for increasing institutional awareness of RDM services. Additionally, the findings indicate that some of the marketing methods employed by institutions in lobbying for and boosting awareness of World Digital Preservation Day near the end of the year, are effective in highlighting the relevance of institutional RDM services.

Bhojaraju and Panorea (2017:10) indicated other ground-breaking ways to raise awareness of RDM, using social media and highlighting the significance of RDM across the globe. The study's findings corroborate those of Bhojaraju and Panorea (2017) about the importance of social media platforms, such as Twitter in reaching out to their target community and the critical significance of RDM. These findings demonstrate the critical role that social media plays in advocating for and increasing awareness of the services offered by libraries to their patrons. Platforms, such as Twitter took a lead when it comes to a customised marketing tool for RDM, while platforms, such as Facebook cuts across all library services.

Mushi et al. 2020 stress the importance of marketing library services at institutional meetings, training and workshops (Mushi et al., 2020:6). Koopman and de Jager, (2016:6) highlighted tools that can add more value in marketing RDM, such as LibGuides, workshops and conferences to support exploration records' generators while engaging broadly with targeted users. The study's findings also corroborate Mushi et al.'s (2020) and Koopman and de Jager's (2016) assertion that launching and hosting regular training sessions as part of various marketing and training series, such as the Digital Scholar series, are crucial. These series are registered using LibCal and are publicly accessible to institutional account users. Additionally, the findings emphasize the importance of libraries marketing their services through Libguides, library websites, Wiki, newsletters and social media channels. According to the findings, these marketing techniques increase library services' visibility to users and track the impact of each communication sent to the community. The findings evidently show that these marketing tools are able to be customized and to reach out to targeted clientele.

The study's findings also indicated that institutions could track the extent of stakeholder participation while marketing a service by utilizing Google Analytics, attendance registers, and LibCal to determine the impact of their marketing initiatives.

Chawinga and Zinn (2020:3) raised a number of other challenges in supporting Creaser and Spezi (2014:33), to mention but a few, such as deficiencies of skills, which is one of the most noticeable challenges that are obstructions in the RDM progress. The study's findings outweighed the obstacles impeding RDM advancement, such as leadership deeming the entire subject too technical and difficult. Additionally, the research identified an interest in so-called details, which makes moving anything ahead strategically, extremely difficult, if not impossible. Lack of RDM skills among information specialists has contributed significantly to the scarcity of professional development possibilities that would equip information specialists with the required capabilities to successfully branch out into technical RDM services. Technologies enable people to connect, regardless of time and place constraints.

Without a shift in leadership mind-set and strategy, particularly in terms of effective recruitment, pay, and retention, RDM services would continue to languish in obscurity, if they ever launch at all. It is a complex and dynamic industry that requires highly

competent, educated, and committed personnel. Without it, it will be little more than another useless and irritating box-ticking exercise, imposed on an already overworked pool of researchers and teaching professionals.

5.6 Policies that support RDM in selected universities in South Africa

Piracha and Ameen (2019) mentioned that libraries are presently evolved in the development of new organisational RDM policies and services (Piracha & Ameen, 2019:40). Many exploration organisations have established exploration data services in their libraries in response to a funder policy, both internationally and locally, such as the NRF in the South African context. The study's findings indicate that a RDM policy is an effective instrument for service development. Chiware and Mathe (2015:1) supported the notion by stating that in South Africa, some institutions are in the early stages of providing frameworks for RDM services with accomplishment, as policies are being transcribed, set up of an infrastructure, training of library personnel, and awareness and advocacy campaigns held with academia and investigators. The study's findings concur with Chiware and Mathe (2015) in that the RDM Policy, along with several others, such as the Open Access (OA) Policy, POPIA Act and the Intellectual Property (IP) Policy, serve as catalysts for establishing, advocating and marketing effective RDM services in an academic institution. The findings also concurred with Lewi's (2010) pyramid where it highlights RDM's lead on a local data policy and influencing the national data policy. The findings of the study indicated that academic libraries have influential policies that assist with the effective advocacy of RDM services in the organisation. Furthermore, the findings also narrate the connection of the South African Universities' policy standards with the international policy standards.

On the other hand, Piracha, and Ameen (2019:40) state that many Universities in UK are still faced with the challenge of formulating RDM policies and initiation of effective RDM services for their respective clients. Therefore, RDM services cannot be implemented without policies that support its functionality. Furthermore, Piracha and Ameen (2019:40) proposed that the institutional library should take central stage in developing RDM policies that reflect recognitional priorities. The study's findings reveal that there are still barriers to institutions launching successful RDM services,

and the narration of the findings demonstrates that there is still more work to be done. As a result, the policy is not followed, since it is viewed as a 'stick' rather than a 'carrot.'

The other policies and advocacy of RDM are one of the main drivers in enhancing the visibility and marketing of the service as a vital factor. In addition, technical infrastructure is vital in ensuring standards are adhered to, to implement RDM and ensure access to resources (Schirrwagen et al., 2019:2). The advocacy of a policy towards RDM has a major role to play as the director on implementation and promoting the service to the exploration community, while the findings of the study reveal that policies do not operate in isolation. They necessitate targeted, long-term advocacy efforts. However, policies are an effective means of developing a service. Without policies, expensive services and platforms would always be subject to the whims of those with money.

Summary

The researcher reviewed the study's findings, considering the study's aims. The findings were reviewed considering the pertinent literature review and the work of other researchers. The study's findings addressed each of the Chapter One objectives. The findings of the study correlated with literature review and the conceptual framework of the study. The study identified Lewis (2010) pyramid model that consists of nine regions of RDM's motion for libraries. The predictions of this model the study's findings correlated with. A summary of the important findings, conclusions, and recommendations will be included in the following chapter.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The preceding chapters detailed the study's experience results to meet the study's stated research question, "Research data management at Selected Universities in South Africa." This chapter summarises and recapitulates the research in terms of the study's goals and the way they were handled. As mentioned in Chapter One, considering the dominant RDM plan at the organisational hierarchy level, academics begin to devise methods for managing RD support in terms of advice, advocacy, and structure for storage, training, and curation that match the demands of their research community (Cox & Pinfield, 2014:300). Academic libraries have naturally embraced the position and taken the lead in assisting their Universities' RDM efforts. Additionally, this chapter analyses the limits of the research and closes with the study's recommendations. The researcher will connect the dots between the research objectives and the study's conceptual framework, while addressing the study's results. The framework of the study is comprised of nine stages .

6.2 Summary from major findings

The goal of this study was to analyse how research data management is organized in selected South African Universities and to ascertain the impact of marketing research data management services on academic institutions' attempts to preserve the visibility of research data management. Numerous writers emphasized that educational libraries traditionally play a critical role in providing access to intellectual content in a variety of methods. Thus, it is unsurprising that controlling exploration data is a general problem for institutional libraries (Chiwere & Mathe, 2015; Cox & Pinfield, 2014; Tenopir, Dalton, Allard, Frame, Pjesivac, Birch, Pollock & Dorsett, 2015).

This part summarizes the prior chapter's results, while considering the study's aims. The study's aims were as follows:

1. Examine the types of RD in the selected Universities in South Africa.
2. Determine if the various types of RD in the selected Universities in South Africa are available.

3. Examine if the available types of RD in the selected Universities in South Africa are accessible.
4. Explore ICTs that could assist in managing RD in the selected Universities in South Africa
5. Compare strategies that could sustain the selected Universities in South Africa, regarding marketing RDM.
6. Determine policies that could support RDM in the selected Universities in South Africa.

And the 5 themes were derived from the objectives and research questions in the quest to answer the component of the study. However the summary of this study will highlight four themes of the study while merging theme one into theme two.

1. Types of RD in selected Universities in South Africa
2. Accessible types of RD in selected Universities in South Africa
3. ICTs assists in managing RD in selected Universities in South Africa
4. Strategies that sustain RDM in selected Universities in South Africa regarding marketing
5. Policies that support RDM in selected universities in South Africa

6.2.1 Types RD in selected Universities in South Africa

The purpose of this study was to examine how research data management is structured at selected South African Universities and to determine the influence that marketing research data management services has on academic institutions' efforts to preserve research data management's visibility. Surkis and Read (2015:154) emphasise the relevance of data longevity as the greatest indicator of data centrality and the necessity for management.

The study's results indicate that South African Universities adhere to the obligatory NRF statement mandating the establishment of institutional repositories in academic institutions, where the National Research Foundation (NRF) issued an appeal to all institutions upon recognizing the value offered by lost or misplaced raw data. As a result of this feeling, data should be easily accessible to the community while still recognizing the need of managing research data (Tenopir, Sandusky, Allard & Birch

2014:84). As a result, the findings suggested that these repositories are well-established and functional inside these institutions to serve their respective customers. The study's findings indicate that the most often used repository types in academic institutions are institutional repositories and research repositories. These findings are also consistent with step six of the conceptual framework, which states, "Develop local data curation capabilities" (Lewis, 2010:12).

The findings explain that after libraries engage in legitimate data storage and curation capability, both lobbying and research funding policies influence investigators' behaviour. Numerous event studies are available to aid library and institutional management in making appropriate selections, and several institutional repositories (IRs) begin to prioritise data curation (Lewis, 2010:12). The libraries' devotions have been evident in this study through the accessibility of repositories as repositories are easily accessible to view the content that is stored, and the content is viewable by anyone, not just registered clients of designated organizations. However, only those who have been designated as registered clients can retrieve files from those repositories.

The researcher concluded from the data that diverse South African Universities comply to the NRF statement and have functionally sustainable research that can benefit their individual communities. These results corroborate the sixth and second steps of the study's conceptual framework. The concept of step two states that libraries should give data guidance to researchers, which is obvious from the study's findings that libraries are more than capable of offering and directing researchers to the appropriate viewpoint of RDM services being supplied to the intended audience. Visibility of the services offered results in several avenues for word-of-mouth promotion, while unconventional marketing techniques result in a deeper knowledge of the customer serviced.

6.2.2 ICTs assists in managing RD in selected Universities in South Africa

Qualitative research on RDM conducted by Pienaar (2011:3) at the University of Pretoria revealed that knowledge of ICT infrastructure and institutional frameworks are critical resources in RDM. The progress of technology both strengthens and centralizes the authority and control of research in academic institutions. The study's findings mirrored those of other writers about the critical role played by ICT, not only

in the implementation of the RDM, but also as one of the most critical pillars without which the RDM cannot operate. Chiware and Backer (2018:13) discuss the library's role in increasing institutional awareness of RDM services and propose that providing training and technical assistance to users' libraries, should take precedence in advocating for RDM.

The ICT assistant is a key role throughout the life of RDM and is not a one-time maintenance task. This demonstrates the central role of Information and Communication Technology (ICT) in the RDM life-span support system. The study believes that effective RDM functionality requires not just an individual with an awareness of ICT abilities, but also an ICT division that serves as a primary support system for RDM functionality.

6.2.3 Strategies that sustain RDM in selected Universities in South Africa regarding marketing

According to the study's results, academic institutions may use a range of strategies to boost their visibility and attract a wider clientele, all while making their services more recognized. The study's findings substantiate phases three (Develop researcher data awareness) and four (Teach data literacy to postgraduate research students) of the conceptual framework, which emphasize the criticality of fostering awareness of RDM, while performing less formal training programs to cover RDM occurrences. Grynoch (2016:10) concludes that RD managers and librarians must become advocates for open data and the spokespeople for data management standards, skills, and education advancement. The study's findings support Grynoch's (2016:10) assertion that the RDM manager and RDM team should not depend on the marketing department, but rather should be inclusive in marketing and take the lead in advocating for and creating awareness of RDM services in the community. This study's conclusion confirms what the conceptual framework step one states: training academic library employees about the general degree of knowledge that exists about e-research and data management issues.

Bhojaraju and Panorea (2017:10) suggested further ground-breaking strategies for increasing awareness of RDM, including the use of social media and emphasizing the disease's global relevance. Similarly, Kumbhar (2014:478) notes that libraries are using various media, such as YouTube to connect with their users, resulting in

increased viewing. The study's findings also highlighted the importance of social media sites in advertising RDM services to the target audience; the most often cited social media platforms, including Facebook, Twitter, and Instagram, are utilized by the RDM team to promote RDM services to the academic community. Additionally, the study reveals that generating YouTube videos helps promote the RDM service.

According to authors, such as Sewell and Kingsley (2017:151), including RDM within International Open Access Week might also be a helpful method to advertise the service. Additionally, training initiatives, such as International Open Access Week supplement current education with the goal of developing client-specific tailored programs (Sewell & Kingsley, 2017:151). According to the study's results, Open Access and Research Week are popular events for promoting RDM services and are targeted towards a certain audience. Additionally, the study found that these events are especially attractive to the Universities' early researchers and are well-packaged to offer critical information to the researcher community.

Koopman and de Jager (2016:6) emphasized the importance of tools, such as LibGuides, seminars, and conferences in assisting research record creators while interacting extensively with intended consumers. Si et al. (2019:296) also emphasized the importance of guides in marketing RDM services, stating that they provide clear, easy-to-follow instructions. The study's finding also suggests that the employment of LibGuides has a part in the RDM's marketing. Additionally, the research found that adding events to the library calendar supports successful community service marketing. By using these numerous platforms in marketing RDM services, institutions may get insight into the effect of each promotional material that has been delivered through Google analytics. The study's results illustrate the beneficial effect of planning a series of events targeted at certain audiences who are crucial in advocating for and creating awareness about RDM.

On the contrary, Brown, Wolski and Richardson (2014:226) assert that increasing institutional knowledge of data management is a serious problem, and the advantages of actively managing research data are immeasurable. Creaser and Spezi (2014:36) continue by adding that the most successful method of engaging with stakeholders seems to be via advertising of new or current services, database trials, and general announcements on library websites. According to the report, there is still ad hoc

leadership in RDM services, which is prone to technical challenges and difficulty in maintaining patterns. Additionally, the research identified an obsession with so-called details, which makes strategic thinking very difficult, if not impossible.

Chawinga and Zinn (2020:3) identified several additional issues in support of Creaser and Spezi (2014), including the fact that a lack of skills is one of the most significant impediments to RDM advancement. Librarians are deficient in a variety of RDM skills and expertise. The lack of RDM skills among librarians has been ascribed in large part to "a scarcity of professional development opportunities that would provide librarians with the competences required to effectively branch out into technical RDM services." Technologies enable individuals to connect, regardless of time and geographical constraints. Additionally, the research found that a lack of professional development opportunities that would provide information professionals with the required competencies to effectively branch out into technical RDM services, has been aggravated by a dearth of RDM skills among information experts. Due to technology improvements, people may engage regardless of time or place. Without a shift in leadership's mind-set and strategy, especially in terms of effective recruitment, pay, and retention, RDM services will stay in the shadows, if they ever launch at all. It is a complex and dynamic industry that requires highly trained, educated, and committed personnel. Without it, it will be another fruitless and annoying box-ticking exercise imposed on an already overworked pool of academics and educators.

The researcher concluded from the study's results that it is vital for the RDM team to play a significant part in the service's marketing. By taking the lead in marketing, it improves the quality of community awareness, while also attracting the right kind of client for the service being supplied. Additionally, since we live in a digital revolution period, having a social media presence, increases awareness and comprehension of where your customers are. Because the world is becoming digital, institutions must analyse and coordinate their marketing strategies to meet their customers' expectations in this digital age. Additionally, Web 2.0 technology is critical for synchronizing service and mapping the library's exposure outside the institute's working hours.

6.2.4 Policies that support RDM in selected universities in South Africa

RDM policies and lobbying are the primary drivers of service exposure, and marketing is critical. Technical infrastructure is critical for sustaining standards and providing the greatest possible use of RDM services by academic institutions, while also guaranteeing seamless access to resources (Schirrwagen, Cimiano, Ayer, Pietsch, Wiljes, Vompras & Pieper, 2019:2). Due to the land's lack of RDM, supporting policies critical to the deployment of RDM services at academic institutions, are necessary. According to the study's conclusions, the RDM's operation involves the coordination of several policies. Two critical roles addressed in the study are the Open Access (OA) Policy and the Intellectual Property (IP) Policy. The operation of these rules lays the groundwork for advocating for RDM services at academic institutions.

Due to the interdependence of the RDM's functioning with other policies, the research found that the RDM policies cannot function successfully without the assistance of other policies. Consequently, it is necessary to develop supportive policies to advocate for long-term service in the RDM community.

6.3 Challenges

The succession of the path is determined by the challenges. This investigation faced different challenges. In overall the challenges was the participation from selected institutions.

The difficulties dictate the order of the course. This inquiry was confronted with a variety of difficulties. In general, the difficulties stemmed from the limited involvement of chosen institutions.

1st Institution:

External researchers are not authorised at this University if their intended participants are staff. Permission may be granted only if you are a staff member.

2nd institution:

Due to COVID-19 Pandemic regulations, the researcher did not get a response from this institution.

3rd institution:

Due to COVID-19 Pandemic regulations, the researcher did not get a response from this institution and is prohibited from working from home by COVID-19 Pandemic rules.

4th institution:

The University gave permission to the researcher, but the volunteers refused to participate. The researcher sought to contact several individuals numerous times to get permission to participate in the study.

5th institution:

The University gave permission to the researcher, but the volunteers refused to participate. The research has a small sample size.

5.4 Conclusion

The research fulfilled the investigation's objective. The study's findings demonstrate the critical significance of properly constructed and promoted RDM services at selected Universities. The result of the research is based on the documentation of the data.

6.5 Recommendations for future research

Following the conclusion of this inquiry, some practical recommendations were made. The purpose of this research was to ascertain how RDM marketing is carried out in South African Universities. The research focused only firms that have implemented RDM services. The researcher made suggestions based on the findings and a review of the existing literature, as well as the investigation's goals.

- A subsequent study should apply qualitative research techniques to delve further into some of the respondents' comments.
- Since this is a new specialist topic in the South African library world, the researcher suggests more study on the subject. It is often misunderstood by Librarians who do not deal daily with RDM.
- The researcher recommends that periodical seminars be held to educate Librarians on the importance of RDM in academic institutions. The division's personnel level should be increased.

In line with the findings of the study, several practical recommendations were made. Future study is needed for research data management as there are still many institutions that are in the process of implementing and deploying the RDM services in their institutions.

Summary

This chapter summarized the study's results, conclusions and recommendations. Chapter One presented the RDM study's inquiry and basic background information at selected Universities. Additionally, it includes the research subject, the goals and objectives, definitions of key terms, and a description of the research methodology and methodologies used in the study. Additionally, it has sketched the dissertation's proposed format and provided a summary of the dissertation's remaining chapters. Chapter Two adequately addressed the conceptual framework and literature evaluation, and the study's recorded data were included. Additionally, the intellectual underpinnings of the investigation were discussed. Chapter Three described the investigation's research methodology, where the methodology and population, sample size, tools, data collection techniques, and ethics were emphasized in the section. The study's fourth chapter was devoted to data analysis, interpretation, and discussion of the findings. The last chapter made suggestions based on the study's results. The study achieved its objective of the investigative matter. The findings in this study evidently demonstrate the significance of established proper RDM services in selected Universities and marketed in various institutions.

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APPENDIX 1: INFORMED CONSENT FORM

CONSENT TO PARTICIPATE IN THIS STUDY

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the partake in answering the online questionnaire via google forms platform.

I have received a signed copy of the informed consent agreement.

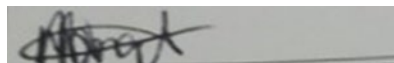
Participant Name & Surname (please print)

Participant Signature.....Date.....

Researcher's Name & Surname:

Nambitha Manqola

Researcher's signature



..... Date 06 September 2021

APPENDIX 2: REQUEST FOR PERMISSION LETTER

Request for your participation in a master's study

Dear Prospective participant

My name is Nambitha Manqola and I am a master's student at UNISA. I am conducting a study titled: "**Research data management in Selected Universities in South Africa**" at UNISA. My supervisor is Professor Isabel Schellnack-Kelly.

The central goal of this exploration is to highlight how research data management in selected Universities in South Africa are organised. This would help proffer marketing strategies that could help academic institutions to enhance RDM services, such that, fulfilling community users' information needs. The study also seeks to establish the impact that marketing of RDM services has on academic institutions in sustaining the visibility of research data management in an academic institution. The outcomes of this enquiry may contribute to the body knowledge of RDM and fills the existing gap in the literature while highlighting the importance of promoting RDM effectively. Furthermore, the outcomes can be used as benchmarking documentation by academic institutions that have interest in marketing strategies of RDM in their designated institutions. Also, institutions that want to improve their marketing strategies.

The target group of the study is stipulated as follows: Research data managers, Research data supporting staff, Faculty librarians, Library and Information Technology team and the Marketing team of the library whom are the RDM service providers of the University of Johannesburg institution. I would appreciate your assistance in circulating to the relevant staff of your division as the target sample of the study.

Please let me know if you are interested to participate in this study by clicking on this link shorturl.at/kwxl3 Friday, 24 September 2021. The link entails consent form and questionnaire to the study. The questionnaire is no longer than 20-25 minutes.

I am attaching the UJ permission letters and the UNISA ethics clearance of the study. I would like to thank you in advance for partaking on the study.

APPENDIX 3: APPROVAL LETTER FROM UNIVERSITY OF JOHANNESBURG



13 May 2021

Ms N Manqola (Student # 46289631)
University of South Africa

Dear Ms Manqola

PERMISSION TO CONDUCT RESEARCH AT THE UNIVERSITY OF JOHANNESBURG (UJ)

The request for the project titled *Research Data Management in Selected Universities in South Africa* refers. Institutional permission is granted to conduct this study at the University of Johannesburg.

Sincerely

Dr Carol Nonkwelo
Executive Director: Research and Innovation
Email: cnonkwelo@uj.ac.za

APPENDIX 4: ETHICAL CLEARANCE LETTER



COLLEGE OF HUMAN SCIENCES RESEARCH ETHICS REVIEW COMMITTEE

19 January 2021

Dear Miss Nambitha Ntsoaki Manqola

Decision:
Ethics Approval from 19 January
2021 to 18 January 2024

NHREC Registration # :
Rec-240816-052
CREC Reference # : 2021-
CHS - 46289631

Researcher(s): Ms N.N. Manqola email: [46289631 @mylife.unisa.ac.za](mailto:46289631@mylife.unisa.ac.za)

Supervisor: Dr I. Schellnack-Kelly

Title: Research Data Management in Selected Universities in South Africa

Degree Purpose: Masters

Thank you for the application for research ethics clearance by the Unisa College of Human Science Ethics Committee. Ethics approval is granted for three years.

The *low risk application* was reviewed by College of Human Sciences Research Ethics Committee, on 19 January 2021 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the College Ethics Review Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.



APPENDIX 5: QUESTIONNAIRE

Questionnaire

Title: Research Data Management in Selected Universities in South Africa

Problem statement

The capacity at which RD formed based on the progression in the technological revolution that generates the necessity aimed at the administration of exploration records as well as sharing and reuse of the data (Cox and Pinfield 2014:299). Libraries have played a proactive role in marketing their services and this has become the basis for which mapping the institution's output through utilising RDM services become essential (Tripathi, Shukla and Sonker 2017:417). Surkis and Read (2015:7) identified several challenges confronting research institutions concerning RDM amongst them are the deficiency of guidelines on good practise (policy) and advocacy, insufficient human resources, technological obsolescence and insecure structure. Many institutions have incorporated their policies on their libguides and the question is are those policy fully addresses and secures the participation of the stakeholder (researchers, PhD)? In addition, Cox and Pinfield, (2014:300) libraries have conventionally commenced with raising awareness and training events in numerous capacities, and about RDM. Kamara (2017:7) emphasises on marketing strategies to help structure promotional events of all products and services. The lack of visibility and marketed of new service in academic institution results to unknown of the service and underutilised. The visibility of RDM services on the university website is important and in some institutions (e.g WITS libguides) is hidden within many tabs into such an extent the users can easily get lost while trying to locate the service offered. While some of the institutions library website does not offer full information that can assist the user to be independent. Many institutions clearly stipulated their targeted clientele on their policy documentations and on their libguides. Therefore, any library services need to be marketed to target the relevant audience such as researchers, postgraduate students (both Masters and PhD), as these patrons adds value to the institution through the output of the research data they produce. Policies and advocacy of RDM are the main drivers of the visibility and marketing of the services is crucial. Technical infrastructure as well plays crucial part in upholding standards, enhances access, ensuring best employment of RDM service to the academic institution whilst

making sure, access to resources is seamlessly smooth (Schirrwagen, Cimiano, Ayer, Pietsch, Wiljes, Vompras, and Pieper, 2019:2).

The recognition of the impact that marketing of RDM has on academic institutions sustains the visibility of RDM and adds value in the mapping academic institution's output. South African academic institutions become more involved in RDM, and it is necessary to create awareness of the services. According to Tenopir *et al* (2015:325), the library staff plays a critical role in raising promotions and encouraging targeted users to participate in RDM services as well as training sessions. In some of the institution staff complement in RDM services is posing a challenge in service delivery. As the demand of this nature increases therefore the institutions need to add more staff complement and upskill other library staff with RDM skills.

Research objectives

The following research objectives were used to guide the study.

- Examine the types of RD in the selected universities in South Africa.
- Determine if the various types of RD in the selected universities in South Africa are available.
- Examine if the available types of RD in the selected universities in South Africa are accessible.
- Explore ICTs that could assist in managing RD in the selected University universities in South Africa
- Compare strategies that could sustain the selected universities in South African regarding marketing RDM.
- Determine policies that could support RDM in the selected universities in South Africa.

Research Questions

The succeeding queries will assist the researcher in identifying the current state of RDM existence and marketing strategies used.

- What types of RD exists in the selected universities?
- What kind of RD services is available in selected universities?
- Is RD service publicly accessible in selected universities?

- How RD in the various South African universities Managed?
- What is the ICTs role in assisting the universities in South Africa in managing RD?
- What strategies are implemented to determine the effectiveness of RDM in the selected universities?
- Are there any marketing strategies used in the selected universities to sustain RDM service?
- Which policies are in place to support RDM in the selected universities?
- What is the role of policies and advocacy, procedure in ensuring the effectiveness of RDM in the selected universities?

SECTION A: DEMOGRAPHIC INFORMATION

Q1: Please indicate whether you are

1) Female	
2) Male	

Q2: Please indicate your ethnicity:

1) African	
2) Asian	
3) Coloured	
4) White	
5) Other	

Q3: Please indicate your age range:

1) 20- 30	
2) 31-40	
3) 41-50	
4) Over 50	

Q4: Please indicate your institution

1) University of Cape Town	
2) University of Johannesburg	
3) University of Pretoria	
4) Stellenbosch University	
5) University of Witwatersrand	
6) University of South Africa	

Q5: Are you involved in RDM services

1) Yes	
2) No	

Q6: What role do you play in RDM service in your institution?

.....

Q7: Please indicate your designation

1) Research data manager	
2) Research data supporting staff	
3) Faculty librarians	

4) Information and Communication Technology	
5) Marketing team	

Q8: How long have you been involved with RDM TEAM?

1) Less than year	
2) 1-2 years	
3) 3-4 years	
4) 5 - Over	

SECTION B: General information

Q9: Type/s of Research Data you are familiar with?

1) Subject base repository	
2) Research repository	
3) National repository	
4) Institutional repository	

Q10: What type of Research Data services are available in your institution?

1) Subject base repository	
2) Research repository	
3) National repository	
4) Institutional repository	

Q11: Is your Research Data Publicly accessible

1) Yes	
2) No	

Q12: If no, why is not accessible?

.....

Q13: How long do you have RDM services in your institution?

1) Less than 2 years	
2) More than 2years	
3) 3-5 year	
4) 5 or more	

SECTION C: Managing RDM services

Q14: How do you manage RDM in your institution?

.....

Q15: Which policies do you have related to RDM?

.....

Q16: Are those policies effective?

1) Yes	
2) No	

Q17: If no, what can be done?

.....

Q18: What role does those policies play in advocating RDM?

.....
Q 19: What impact does policies and advocacy have towards managing RDM?

.....
Q20: *What role played by the ICT in your RDM service?*

.....

SECTION D: Marketing RDM services

Q21: What role do you play in marketing RDM?

.....

Q22: What marketing strategies do you use to market RDM?

.....

Q23: How do you measure their effectiveness?

.....

Q24: Which web 2.0 platforms do you use in marketing RDM services?

1) Libguides	
2) Library webpage	
3) Social platforms	
4) YouTube	
5) Other	

Q25: If other, please specify

.....

Q26: Does ICT have any impact toward marketing RDM?

1) Yes	
2) No	

Q27: If yes, please specify

.....

Q28: What are contributing factors that affects marketing RDM services?

.....

..... *The end*

APPENDIX 6: CERTIFICATE OF LANGUAGE EDITING

Michelle Woolley

WRITER EDITOR PROOFREADER TRANSLATOR

Bachelor of Library and Information Science: B.Bibl.
Reference & Research Librarian

Associate Member of Professional EDITORS' Guild (PEG)

CERTIFICATE OF EDITING

This letter certifies that I have edited the Dissertation detailed below.

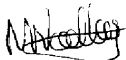
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Regards
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