Staff competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources

Tlhalefo Metlhaleng

MTLTLH006

Supervisor: Associate Professor J. Raju

Co-supervisor Dr R. Raju

A minor dissertation submitted in partial fulfilment of the requirements for the award of the degree of Master of Philosophy (specialising in Digital Curation)

Faculty of the Humanities

University of Cape Town

2018

University of Cape Town

Compulsory declaration

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

Signature: Signed by candidate Date: 20/07/2018

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

University of Cape Town

Dedication

Dedicated to my newly born daughter (Marang Omaatla Lesole), my mother (Lucy Metlhaleng) and Father (Joki Metlhaleng)

Acknowledgements

My special thanks go to my supervisor Associate Professor Jaya Raju; her guidance, encouragement, commitment, prompt feedback and constructive comments and corrections were the driving force behind the successful completion of this study. I would like to pass my sincere gratitude to my co-supervisor (Dr Reggie Raju) who gave me guidance especially on open access issues and institutional repositories. You really made me understand open access better.

My heartfelt thanks go to the mother of my daughter (Thapelo Lesole) who has always been supportive during this journey.

I extend my heartfelt gratitude to Patrick Mapulanga, who always made time to look at my work and gave me guidance where necessary. Your effort is well appreciated, Sir.

To my colleagues Maki Lefalatsa and Challorte Nakandungile, thank you for the support and encouragement you always gave me.

To my parents, brothers and sisters thank you for keeping me in your prayers during my studies.

To my Botswana colleagues studying at UCT as well (Emmanuel, Kago, Tlholego and Motshegetsi), who were always supportive -thank you very much.

Lastly, I would like to thank the Botswana University of Agriculture and Natural Resources for fully financing me throughout my studies.

Abstract

The study sought to ascertain staff competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources (BUAN). In addressing the above objective, the study used the innovation-decision making process of the Diffusion of Innovations (DoI) theory (Rogers 1983) to formulate the following critical questions to guide the study: What knowledge, skills and personal attributes are required in the planning and establishing of a successful institutional repository in an academic institution?; Do BUAN staff (academics and relevant support staff) have the knowledge, skills and personal attributes necessary for planning and establishing a successful repository?; How significant a role do personal attributes such as attitudes and perceptions play in the planning and establishing of an IR at BUAN?; and, What measures may be put in place to reinforce the planning and establishing of an institutional repository at the BUAN Library? The research paradigm suitable for this study was the pragmatic paradigm because of diverse types of data used in the study. The study employed a convergent parallel mixed methods design by using both quantitative and qualitative research methods to collect data concurrently. It adopted a case study approach as the researcher undertook an in-depth enquiry into staff competencies in the planning and establishing of an institutional repository at BUAN. The study population consisted of 201 BUAN academics, three Library repository staff, and two Information Technology (IT) staff. Semi-structured interviews were used to source data from purposively selected library repository staff and BUAN IT staff. A structured questionnaire was administered to the academics. Descriptive statistics was used in the analysis of the study's quantitative data and thematic content analysis for its qualitative data. A number of knowledge sets, skills and personal attributes emerged from the study as being required in the planning and establishing of a successful repository at BUAN, critical amongst these being knowledge of metadata and metadata standards. An important recommendation emanating from the study related to repository advocacy and outreach among BUAN academics as well as on-going training of library repository staff to keep them abreast of latest repository developments.

Table of Contents

Dedication i

Acknowledgements ii

Abstract iii

Table of contents iv

List of tables vii

List of figures viii

List of acronyms and abbreviations ix

Chapter 1: Introduction and background to the study 1

1.1 Introduction 1

1.2 Background to the study 3

1.3 Research problem 4

1.4 Research objective 5

1.5 Critical questions 5

1.6 Motivation for the study 6

1.7 Relevant definitions 7

1.7.1 Competencies 7

1.7.2 Academic library 8

1.7.3 Open access 8

1.7.4 Institutional repositories 9

1.8 Overview of the methodology 9

1.9 Limitations of the study 10

1.10 Delimitations of the study 10

1.11 Structure of the research report 11

1.12 Summary 11

Chapter 2: Literature review 13

2.1 Introduction 13

2.2 Theoretical support 14

2.3 Review of related literature 17

2.3.1 Open access in context 17

2.3.2 The concept of institutional repositories 19
2.3.3 Themes emerging from the innovation-decision process 19
2.4 Summary 30
Chapter 3: Research design and methods 31
3.1 Introduction 31
3.2 Research paradigm 31
3.3 Research design 32
3.4 Research approach 32
3.5 Research methods 33
3.5.1 Study population 33
3.5.2 Sampling 34
3.5.3 Data collection 36
3.5.4 Data analysis 42
3.6 Reliability and validity 42
3.7 Ethical Considerations 43
3.8 Evaluation of research methodology 44
3.9 Summary 45
Chapter 4: Presentation of findings 46
4.1 Introduction 46
4.2 Presentation of findings 47
4.2.1 Biographical information 47
4.2.2 Knowledge, skills and personal attributes required in the planning and establishing of a successful institutional repository in an academic institution 56
4.2.3 Do BUAN staff (academics and relevant support staff) have the knowledge, skills and personal attributes necessary for planning and establishing a successful institutional repository at BUAN? . 65
4.2.4 The significance of the role of personal attributes such as attitudes and perceptions in the planning and establishing of an IR at BUAN 74
4.2.5 Measures that may be put in place to reinforce the planning and establishing of an institutional repository at the BUAN Library 80
4.2.6 General Comments 88
4.3 Chapter Summary 89

Chapter 5: Discussion of main findings, conclusions and recommendations 90
5.1 Introduction 90
5.2 Discussion of main findings 90
5.2.1 Knowledge, skills and personal attributes required in the planning and establishing of a successful institutional repository in an academic institution 91
5.2.2 Do BUAN staff (academics and relevant support staff) have the knowledge, skills and personal attributes necessary for plannning and establishing a successful institutional repository at BUAN? ... 93
5.2.3 The significance of the role of personal attributes such as attitudes and perceptions in the planning and establishing of an IR at BUAN 96
5.2.4 Measures that may be put in place to reinforce the planning and establishing of an institutional repository at the BUAN Library 98
5.3 Conclusions 99
5.4 Recommendations 100
5.5 Chapter summary and general conclusion 101
References 102
Appendix A: Informed consent for interview with library repository staff member 111
Appendix B: Informed consent for interview with information technology (IT) staff 112
Appendix C: Questionnaire for academics 113
Appendix D: Semi-structured interview schedule for library repository staff 122
Appendix E: Semi-structured interview schedule for information technology (IT) staff 124

List of Tables

Table 3.1: Study population……33

Table 3.2: Census and sample……..34

Table 3.3: Mapping the critical questions to sources of data and data analysis strategies…….36

Table 4.1: Academic departments……47

Table 4.2: Academic rank of respondents……51

Table 4.3: Number of publications produced by respondents……52

Table 4.4: Biographical information of library repository staff……..54

Table 4.5: Biographical information of IT staff……..54

Table 4.6: Librarian views on knowledge, skills and personal attributes required to plan an institutional repository in academic institution……..56

Table 4.7: Library repository staff views on knowledge, skills and personal attributes that IR stakeholders should possess……57

Table 4.8: Knowledge, skills and personal attributes required for planning and establishing successful institutional repositories, as reflected in the literature……..59

Table 4.9: How BUAN academics came to know about the IR……68

Table 4.10: Knowledge required by academics to contribute to a successful BUAN IR ……70

Table 4.11: Academics' skills required to contribute to a successful repository……..71

Table 4.12: Relevant personal attributes required by academics to contribute to a successful IR at BUAN ……72

Table 4.13: Reasons why academics believe personal attributes play a significant role in the planning and establishing of the IR at BUAN……..76

Table 4.14: Motivation to ingest/deposit into BUAN's IR……78

Table: 4.15 Reasons for not ingesting in the BUAN IR……79

Table 4.16: Elaborations by academics on measures that may put in place to reinforce the planning and establishing of the institutional repository at the BUAN Library ……82

Table: 4.17: Elaborations by academics on challenges for BUAN's IR……84

Table 4.18: Elaborations by academics on opportunities for BUAN's IR……86

List of figures

Figure 2.1: Innovation-decision process by Rogers……..15

Figure 4.1: Period employed in BUAN as an academic……..48

Figure 4.2: Highest academic qualification……49

Figure 4.3: Age category of respondents……50

Figure 4.4: Number of students graduated……..53

Figure 4.5: Awareness of institutional repository concept……66

Figure 4.6: Awareness of BUAN institutional repository……67

Figure 4.7: Training on BUAN institutional repository……69

Figure 4.8: Significance of the role of personal attributes in planning and establishing of the IR at BUAN……75

Figure: 4.9: Deposited content into the BUAN IR……77

Figure 4.10: Are there measures that may be put in place to reinforce planning and establishing of BUAN……81

Figure 4.11: Are there challenges for BUAN's IR?.....83

Figure 4.12: Are there opportunities for the BUAN's IR?.....85

List of acronyms and abbreviations

AEE	Agricultural Economics, Education and Extension
AEL	Agricultural Engineering and Land Planning
ASP	Animal Science and Production
BCA	Botswana College of Agriculture
BUAN	Botswana University of Agriculture and Natural Resources
BUANL	Botswana University of Agriculture and Natural Resources Library
BIUST	Botswana International University of Science and Technology
BS	Basic Sciences
UKCORR	The United Kingdom Council of Research Repositories
CSP	Crop Science and Production
DOAR	Directory of Open Access Repositories
DoI	Diffusion of Innovations
FAO	Food and Agricultural Organisation
ICTs	Information and Communications Technologies
IR	Institutional Repository
IT	Information Technology
FST	Food Science and Technology
LIS	Library and Information Services
MARC	Machine Readable Cataloguing
OA	Open Access
ROAR	Registry of Open Access Repositories
SADC	Southern African Development Community
SHERPA	Securing Hybrid Environment for Research Preservation and Access
TAM	Technology Acceptance Model
UB	University of Botswana
UK	United Kingdom
USA	United States of America

Chapter 1: Introduction and background to the study

1.1 Introduction

The escalating prices of journal subscriptions and licenses have sparked a debate on ways of addressing this monopoly by publishers. According to Tarrago and Molina (2008: 19) the last few years have witnessed a worsening crisis in scholarly communication largely due to the rising prices of journals and subscription licenses. They point out that libraries' participation in the open access (OA) movement for scientific information arose in response to this crisis. The open access movement advocates for provision of free and full access to research output to the public at large through encouraging publishing in open access journals and uploading research output onto open access institutional repositories (Tarrago and Molina, 2008: 19).

Gosh (2009: 40) explains that the open access (OA) movement is an important movement on the library landscape, and is generating much interest in the profession worldwide. The challenge for librarians is to develop and maintain a sustainable model of open access repositories to manage the intellectual output of their organisations. The benefit of open access repositories to libraries is aimed at addressing the ever-increasing prices of journals and subscription licenses by giving readers "barrier-free" access to the literature, and giving authors larger visibility and greater impact of their research output (Gosh 2009: 40). Gosh indicates that the benefits of OA are enormous and hence librarians and scholars could take advantage of this and plan for and establish institutional repositories for their institutions. The Botswana University of Agriculture and Natural Resources (BUAN) is no exception to this notion.

Institutional repositories (IRs) have gained prominence, both in developed and developing countries, because they offer a solution to the management of content in universities. Much of the content produced by universities is organised using traditional systems particular to an institution, which often hinders access and retrieval. An IR, on the other hand, provides a platform for archiving and managing such information that enables easy access and use by researchers across the world (Ukwoma and Dike, 2017: 17)

The idea of institutional repositories is a very powerful one that can serve as an engine of change for any institution. In their digital age, content is in demand and hence the need for successful information service provision. Therefore information centre and libraries need to develop services in such a way so that the end users may manipulate the content, as per their requirements. In the present scenario, institutional repositories are becoming an indispensable component for information and knowledge sharing in the scholarly world (Sharma, Meichieo and Saha, 2008: 336).

Institutional repositories have been seen as an option to curb the problem of the sky rocketing prices of journals and subscription licenses. Most educational institutions of higher learning, including BUAN, are finding it very difficult to pay exorbitant prices required by journal publishers and vendors to have access to online resources, especially in view of the trend for library budgets to be cut every year due to the financial instabilities currently affecting the global economy.

Although institutions are advocating and buying into the idea of these new initiative, there is the question of whether library staff members and other relevant stakeholders having the required competencies to establish and implement these technology-driven initiative. Institutional repositories are a fairly new development in library and information services and in scholarly communication - hence there are different views about institutional repositories. As Rogers (1983: 164) noted with regard to the Diffusion of Innovation theory: the decision individuals make on whether to adopt or not adopt a new innovation is not an instant act but somewhat of a process which involves different stages. In the context of this study, an institutional repository is regarded as a new innovation and hence, like any other innovation, it has to be exposed to different stages of individuals' innovation-decision processes before people fully adopt it (Rogers, 1983: 164).

1.2 Background to the study

The Botswana University of Agriculture and Natural Resources (BUAN) emerged out of the Botswana College of Agriculture and was established on 29 September 2015 through Act no. 12 of the Parliament of Botswana. This Act abolished the then Botswana College of Agriculture (BCA) which was established on 31 May 1991 through Act no. 9 of the Parliament of Botswana. The Botswana College of Agriculture was an associate institute of the University of Botswana. However, the College has been transforming since September 2015 to be an independent agricultural university under the new name Botswana University of Agriculture and Natural Resources (Botswana University of Agriculture and Natural Resources Act, no. 12, 2015: 12).

BUAN emphasises innovation in teaching and research. Currently the University is expanding teaching facilities, information and communications technology (ICT) infrastructure, student accommodation, and has acquired state-of-the-art research equipment to ensure that the quality of the programmes offered and its research are of international standard, as well as to increase access to education and educational resources. The University, at present has six (6) academic departments: Agricultural Education, Economics and Extension (AEE); Agricultural Engineering and Land Planning (AEL); Animal Science and Production (ASP); Basic Sciences (BS); Crop Science and Production (CSP); and Food Science and Technology (FST) - all offering Higher Diploma, Bachelor Degree, Masters Degree, MPhil and PhD programmes. The University is working on introducing new programmes into its curricula. BUAN has approximately 201 academic staff members and about 250 support staff members (Botswana College of Agriculture, 2015). BUAN has a student population of about 1500, including both undergraduate and postgraduate students. Majority of the students admitted to BUAN are from the local senior secondary schools, with some students coming from different countries around Africa. BUAN also has exchange programmes with agricultural universities from Ireland (Botswana College of Agriculture, 2015). The University is located in Content Farm, Sebele (12km north of Gaborone city centre, Botswana).

The Botswana University of Agriculture and Natural Resources Library (BUANL) was first set up in 1991 when the then Botswana College of Agriculture was established. The vision of the Library is

to be a world-class information service provider contributing towards the growth of the University and the agricultural sector in Botswana. The Library exists to support the teaching, learning, research and outreach activities of the University by: providing information to students, staff and the public; making readily available information sources; providing an environment conducive to studying and learning; providing and managing a platform to host the intellectual output of the University and its stakeholders; and, teaching information literacy to both staff and students (Sekati, 2009).

The Library provides the following services: lending; reader's advisory; current awareness services; inter-library loan service; user education and library orientation where all new students are familiarised with the physical layout of the library, available resources and how to use information retrieval tools. A further service is Internet and computing through which various online databases are accessed. The Library has a special collections unit comprising of government reports; publications of the Food and Agricultural Organisation (FAO) and publications from the Southern African Development Community (SADC); student projects; staff articles; digitised theses and dissertations; video cassettes and slides. The Library has 19 staff members and its structure comprises five sections: special collections section; cataloguing section; information technology unit; acquisitions section and periodicals section (Sekati, 2009). The BUANL serves the university community and other external members.

In response to the call for open access the Library began its journey of planning for and establishing an institutional repository (IR) in 2012 and named it BCAagriSpace. Currently the IR is still on the University's intranet and facing challenges ranging from copyright to staff competencies in running the repository as well as lack of depositing by academics.

1.3 Research problem

BUAN as an academic institution has responded to the rising cost of electronic resources by adopting the green route in open access, that is, setting up an institutional repository (IR). According to Bjork et al. (2013: 3) the green route in open access is when research articles or

manuscripts that precede the finalised article, are made openly and freely available on the World Wide Web through institutional repositories. Since BUANL had set up the institutional repository in 2012 it has been experiencing challenges and delays in getting the repository up and running on the Web. Could academic staff competencies (or lack thereof) as well as competencies of relevant support staff in the planning and establishing of the BUAN Institutional Repository, a new innovation, be a contributor to these challenges? By staff 'competencies' the researcher refers to the knowledge (that is, what one knows and understand), skills (that is, what one can do) and personal attributes (attitudes, values and personal traits) required for planning and establishing a successful institutional repository at BUAN. Further, the repository experiences a low deposit of articles, conference papers, research reports, etc. The University continues to fund research but the findings from this research do not benefit the University community because of lack of access to this research as it is not openly available. The repository is new to the Library and to the University. Hence the need for a study to ascertain knowledge, skills and other competencies required in the planning and establishing a successful institutional repository at the Botswana University of Agriculture and Natural Resources.

1.4 Research objective

The main objective of the study was to ascertain staff competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources.

1.5 Critical questions

In addressing the above objective, the study used the innovation-decision process from Rogers's (1983: 163) Diffusion of Innovations (DoI) theory (detailed in Section 2.2 of Chapter 2) to generate the following critical questions to guide the study:

1.5.1 What knowledge, skills and personal attributes are required in the planning and establishing of a successful institutional repository in an academic institution?

1.5.2 Do BUAN staff (academics and relevant support staff) have the knowledge, skills and personal attributes necessary for planning and establishing a successful repository?

1.5.3 How significant a role do personal attributes such as attitudes and perceptions play in the planning and establishing of an IR at BUAN?

1.5.4 What measures may be put in place to reinforce the planning and establishing of an institutional repository at the BUAN Library?

1.6 Motivation for the study

This study is motivated by the fact that the researcher is employed in the special collections unit at BUANL. The special collections unit is responsible for the planning and establishing of the BUAN Institutional Repository. However, the researcher has observed since his deployment to the section responsible for the IR that the institutional repository has not been running due to challenges involving different issues. Hence the researcher's interest in ascertaining staff competencies in the planning and establishing of an institutional repository at the BUAN. The repository is new to the Library and to the University and therefore the researcher aims to ascertain the knowledge, skills and other competencies that BUAN staff (academics and relevant support staff) require for planning and establishing a successful institutional repository.

Such a study would benefit BUAN as it could contribute to the implementation of a successful institutional repository which in turn would benefit students, academics, researchers and other university constituencies because once the University's intellectual output is made free and open to everyone via the Web, it would be easy to access such content for research purposes without any costs. Further, BUAN authors/researchers would benefit from a functioning repository in terms of increased visibility of and accessibility to their research output which in turn would increase the impact of their scholarly output. BUAN, as the leading agricultural institution in Botswana, is the main source of agricultural information in Botswana and for other Southern African Development Community (SADC) countries. Hence research contributing to the implementation of a successful repository would also contribute to the empowerment of the country and the region in making freely available information relating to agriculture. The Botswana government has recently been funding youth empowerment schemes on agricultural projects - hence free availability of agricultural information through an institutional repository would contribute to the prosperity of these projects. Herein lays the value of this study. Research

(Dlamini and Snyman, 2017: 535; Ivwighreghweta, 2012: 1; Moahi, 2009: 1) has also indicated that there is a lack of studies relating to institutional repositories in Africa. Hence this study adds to the body of knowledge on institutional repositories in Africa.

1.7 Relevant definitions

Terms relevant to the study include:

1.7.1 Competencies

Competencies refers to factors that contribute to good performance of individuals to make the organisations they work in, effective (Armstrong, 2006: 152). Chan (2006: 146) corroborates this by indicating that, competencies include: a blend of knowledge, skills, and personal attributes that are associated with effective and/or superior performance in the job. Competencies can be observed and measurable using well-accepted standards and must be allied with the strategic direction of the organisation and can be improved through training and development (Chan, 2006: 146).

In view of the fact that 'competencies' is the generic term that includes knowledge, skills and personal attributes, it is important to expound on each of these in turn as they have relevance for this study.

1.7.1.1 Knowledge

The *Oxford English living dictionaries* (2017) describes 'knowledge' as facts and information, which one acquires through education and through experience. When someone acquires information it means that they have accumulated knowledge and this knowledge has useful meaning to them (Bellinger, Castro and Mills, 2004: 3). In the context of this study, knowledge consists of information and experiences that are useful to everyday work of academic libraries (Tanloet and Tuamsuk, 2011: 125).

1.7.1.2 Skills

A skill is the ability to apply what has been learnt or acquired to perform a function or task (*Mariam-Webster online dictionary, 2017a*). Skills are acquired through learning. In the context of this study, Tanloet and Tuamsuk (2011: 125) describe skills as the ability of academic librarians or information professionals to put into use or apply the knowledge they have to the operations of academic libraries.

1.7.1.3 Personal attributes

Personal attributes refer to attitudes, perceptions, values and personal traits. An attitude is the way a person thinks and feels about someone or something (*Mariam-Webster online dictionary, 2017b*). In the context of the academic library, Tanloet and Tuamsuk (2011: 125) refer to personal attributes as the thoughts, feelings, opinions, attitudes, motivation, and personal needs of information professionals that are related to the work in academic libraries.

1.7.2 Academic library

Sharma and Vishwanathan (2001: 10) point out that traditionally a library was a place where books and other artistic materials were kept. In the modern context, the library is oriented towards collections (both physical and virtual) and custody, allowing people to make use of the facilities (both in-house as well as remotely). An academic library exists to support the teaching, learning and research of an academic institution. It supports an academic institution in achieving its organisational objectives and goals.

1.7.3 Open access

According to the Budapest Open Access Initiative (2012: np.), open access refers to the

> free availability of scholarly output on the public Internet domain permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these materials, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the Internet itself.

This study views open access in this light.

1.7.4 Institutional repositories

Lynch (2003: 328) views an institutional repository as a service that a university offers to members of its community for the management, preservation and access to digital resources created within the institution and its relevant stakeholders. In essence, an institutional repository is a Web-based database of scholarly material which is institutionally defined as compared to other repositories such as subject-based repositories. Crow (2002: 4) defines institutional repositories as databases of digital collections that are designated to capturing, preserving and making accessible the intellectual output of university community.

1.8 Overview of the methodology

The research paradigm suitable for this study was the pragmatic paradigm because the researcher based the inquiry on the assumption that collecting diverse types of data will deliver a broader understanding of the research problem (Creswell, 2014: 19). This study employed a convergent parallel mixed methods design by using both quantitative and qualitative research methods to collect data at the same time (Creswell, 2014: 19). It adopted a case study approach as the researcher undertook an in-depth enquiry into staff competencies in the planning and establishing of an institutional repository at BUAN for better understanding of this case (Yin, 2009: 19).

The population for this study consisted of 201 academics from six BUAN academic departments, three (3) purposively selected members of the Library staff responsible for the repository and two (2) purposively selected Information Technology (IT) staff providing IT support for the repository. A census of all 201 BUAN academic staff members was opted for because, as a newly established independent University, there is much staff development taking place at BUAN and therefore many academics are away on training - hence the questionnaire would have not received an adequate response rate if a sample was targeted. The study used semi-structured interviews to collect data from purposively selected library repository and IT staff. A structured questionnaire was administered to academics.

Data collected using the structured questionnaire were analysed using *Microsoft office* tools where necessary. The findings were presented in terms of the study's research questions with guidance from the Diffusion of innovations theory's innovation-decision process. Data was compiled into frequency distribution tables and cross tabulations (descriptive statistics) to determine the interrelationship between variables. With responses to the few open-ended questions in the questionnaire and those from the interviews, the researcher undertook thematic content analysis and generated frequency distributions tables, and subsequently looked for any patterns within these responses that could yield additional information on staff competencies in the planning and establishing of a successful repository at BUAN.

1.9 Limitations of the study

Limitations, as explained by Simon and Goes (2013), are matters and occurrences that arise in a study which are out of the researcher's control and limit the extent of the study. Currently, (BUAN) is still undergoing a transformation process and hence much staff development is taking place. Due to this, many of the academic staff members are on training and hence the questionnaire did not receive the high response rate desired. This was exacerbated by the fact that some academics did not take time to respond to the questionnaire. Notwithstanding these challenges, the researcher is satisfied that he persevered at the data collection (see Section 3.5.2 Chapter 3) and an eventual return rate of more than 50% was adequate to reflect repository behaviour patterns among BUAN academics.

1.10 Delimitations of the study

Simon and Goes (2013) explain delimitations as issues emanating from the precise decisions made by the researcher. The study was delimited to BUAN because of the size (minor dissertation), the nature (case study) and scope (that is focusing only on the BUAN Library) of the study. Time constraints (UCT requirements to complete the minor dissertation) and financial resources (funds to travel around for data collection in other institutions in Botswana) also delimited this study to BUAN only. However, the researcher believes that focusing the study at BUAN enabled the researcher to investigate staff competencies in the planning and establishing

an institutional repository at BUAN in detail. The study was also delimited to academics because academics are the ones who produce most of the intellectual output of the institution and supervise masters and PhD studies which form a significant part of the content deposited into the repository. Only BUAN library repository staff were included in the study because of their involvement with the IR. Information Technology staff from BUAN were also included because their roles and responsibilities with the IR.

1.11 Structure of the research report

This research report has five chapters. Chapter 1 presents an introduction, background to the study, research problem, study's main objective, critical questions guiding the study, motivation for the study, definitions of relevant terms, overview of the methodology the study employed, limitations and delimitations of the study, all relating to staff competencies in the planning and establishing of an IR at BUAN. Chapter 2 discusses the innovation-decision process of the Diffusion of Innovation theory informing the study. The chapter also reviews literature related to the study in the context of the theory informing the study. Chapter 3 presents the research design and methods (that is pragmatic paradigm, the convergent parallel mixed methods research design and the case study approach). The details about the study population and the sampling methods used are presented in this chapter as well. The findings from the data collected from academics, library repository staff and IT staff are presented in Chapter 4 using graphs, tables and narratives. The main findings are discussed in Chapter 5 in the context of the study's critical questions and the DoI theory's innovation-decision process informing the study as well as the literature reviewed. Based on this discussion, conclusions are drawn and recommendations are made in this final chapter. A list of references cited throughout the report follows and, lastly, all necessary appendices are attached.

1.12 Summary

This chapter introduced the study by providing a context for the research area being investigated. The background of BUAN as an institution and its library were presented because this served as the research site for the study. The research problem, main objective (to ascertain staff

competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources) of the study its critical questions were presented in this chapter. Terms relevant to the study were explained and the chapter also presented the motivation for the study, an overview of the research methodology employed, limitations and delimitations of the study. Finally, the structure of the research report was outlined. The next chapter discusses the theory informing the study and reviews relevant literature

Chapter 2: Literature review

2.1 Introduction

A literature review is a "systematic, explicit and reproducible method for identifying, evaluating and synthesising the existing body of completed recorded work produced by researchers, scholars and practitioners on a given topic" (Fink, 2005: 3). This section is important to the study because it enables the researcher to know and understand what is known about the area of research under study. Creswell (2014: 28) points out that a literature review shares with the reader the results of other studies that are closely related to the one being undertaken. Creswell further alludes that the literature review provides a framework for establishing the importance of the study as well as a benchmark for comparing the results with other findings. Punch (2014: 97) reiterates the importance of reviewing literature by pointing out that reviewing literature helps investigators to assess critically what is known on the topic under investigation, and to locate the study in relation to the reviewed literature.

According to Kumar (2005: 30) a literature review has a number of functions, including providing a theoretical background to the study and reviewing the means by which you establish the links between what the researcher is proposing and what is in place or has been studied; hence this helps the researcher to refine the study's research methodology.

This chapter reviews literature by different scholars relating to open access and institutional repositories especially literature relating to staff competencies in planning, establishing and implementing of institutional repositories. This chapter has two sections. The first part discusses the innovation-decision process of the DoI theory (Rogers, 1983: 164) informing the study and the second part reviews the literature in relation to themes emanating from the theory supporting the study and informing the study's research questions. Open access and institutional repositories as key innovations relevant to the study, form the opening themes of the literature review.

It is important to review the literature in relation to the theory framing the study because, according to Kumar (2005: 30), unless you review the literature in relation to the study's theoretical framework, you will not be able to develop focus in your literature review. Kumar (2005: 30) further states that when reviewing the literature, the information obtained from different books and journals needs to be sorted under the main themes and theories highlighting agreements and disagreements among the authors and identifying the unanswered questions and gaps. This assertion by Kumar reiterates how important it is to review literature in relation to the study's theoretical framework.

2.2 Theoretical support

The study is largely informed by concepts emanating from the innovation-decision process from the Diffusion of Innovations (DoI) theory. According to Rogers (1983: 163) the innovation-decision process refers to the process which individuals' pass through from: knowing about an innovation; to developing attitudes and perceptions regarding the innovation; to a decision to use or reject the innovation; to implementation of the new innovation, and to confirmation of the decision that the individual has made about the innovation. In support of this Katz, Levin and Hamilton (1963: 237) explains that diffusion is the process by which an innovation is transferred through certain channels over time among the people within a social system. They further explain that the process of diffusion is the acceptance over time of some specific item, an idea or practice by individuals or groups. Rogers (1983: 163) indicates that this is an exceptional type of communication because the messages communicated are concerned with new ideas. These expositions reflect that, it takes a process and time for people to adopt new innovations.

Based on this theory then, institutional repositories are a fairly new development in scholarly communication and may be regarded as an innovation. The innovation-decision process of the DoI theory would assist the researcher, in this study, to ascertain staff competencies in the planning and establishment of an institutional repository at BUAN. Since IRs may be regarded as a new innovation there might be a possibility that the decision-making concepts emanating from the Diffusion of Innovation theory may apply to the problem being investigated by the study, that

is, challenges in terms of staff competencies in the planning and establishing of institutional repository at BUAN. Rogers (1983: 164) indicates that decisions individuals make about whether to adopt or not adopt an innovation is not an instant act but somewhat of a process which involves various stages. Hence acquiring of necessary competencies (knowledge, skills and personal attributes) for the successful establishment of an IR is not likely to be instantaneous but part of process involving various stages of decision-making. Rogers (1983: 164-185) identified the following five-stages of the innovation-decision process:

i. Firstly, the knowledge stage occurs when an individual is exposed to the innovation's existence and gains some understanding of how it functions;
ii. After being aware or gaining knowledge about an innovation, there has to be persuasion on the part of an individual. At the persuasion stage, an individual becomes more psychological with the innovation; he or she seeks information about the new idea. He or she wants to know more about the new idea;
iii. The main outcome of the persuasion stage is decision making. Decision occurs when an individual engages in activities that lead to a choice to adopt or reject an innovation;
iv. The fourth stage is the implementation stage which occurs when an individual puts an innovation into use; and,
v. Lastly, after an individual has passed all the stages there has to be confirmation which occurs when an individual seeks reinforcement of an innovation, the decision already made, but he or she may reverse the previous decision if exposed to conflicting messages about the innovation.

The innovation-decision process by Rogers (1983: 164) is illustrated in Figure 2.1.

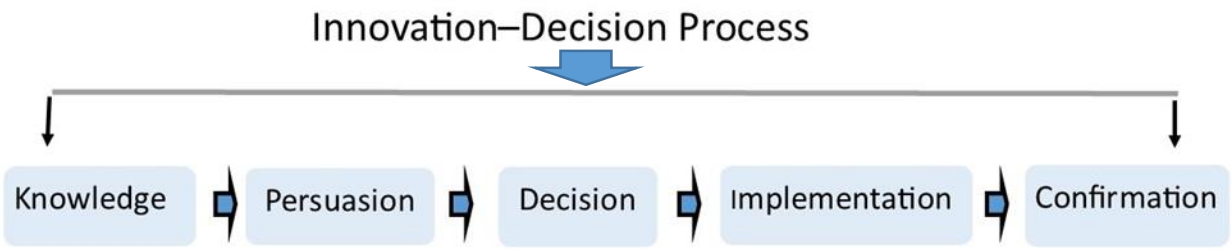


Figure 2.1: Innovation-decision process by Rogers
Source: Rogers (1983: 164)

This five-stage concept has relevance to this study because institutional repositories are regarded as a new innovation and people view these innovations in different ways and accept or reject them in different ways at different times. Furthermore, the theory is important to this study because it will assist to determine whether staff at BUAN have the necessary competencies for planning and establishing an institutional repository at BUAN or are they, as the DoI innovation-decision process suggests, still in the process of acquiring such competencies. Through guidance of the concepts emanating from innovation-decision process the study sought to ascertain staff competencies in the planning and establishing of IR at BUAN.

The researcher also considered the Technology Acceptance Model (TAM) as one of the decision-making models in technology innovations and also relevant to this study. With the growing technology innovations there has been an increase in system failures in organisations, and this has resulted in many researchers getting interested in predicting how the systems are being used. Many studies carried out have not yet succeeded in producing reliable measures that could explain why people rejects or accept new innovations. In 1985 Fred Davis proposed the Technology Acceptance Model (TAM) with the aim of producing a reliable measure that could explain system rejection and adoption by individuals and organisations (Davis, 1989: 320). Davis indicated that a system can be affected by users' attitudes, perceptions and motivation, which are directly influenced by the external factors consisting of the actual system features and capabilities as well as perceived usefulness and perceived ease of use (Davis, 1989: 320).

Although concepts from the TAM have relevance to the study under investigation the model does not cover the issues regarding knowledge and skills which forms a basis for individuals to adopt or reject a system, which the innovations-decision process of the DoI theory Rogers (1983: 164) covers in detail. Based on this, the researcher selected DoI theory's innovation-decision process concepts to frame the study because it includes the fundamental stage of awareness in decision making.

2.3 Review of related literature

It is important to begin the review of literature with the themes of open access and institutional repositories because these innovations in scholarly communication are central to the study. This would be followed by reviewing of literature by themes relating to the concepts in Rogers's (1983: 164-185) DoI five-stage innovation-decision process. The reviewed literature was sourced via various databases. Google Scholar was the first search stop and results from Google Scholar led the researcher to various databases including: Science Direct; Emerald; Africa Wide Information via EBSCOhost; Academic search Premier via EBSCOhost; Library and Information Science Abstracts (LISA) via ProQuest and ERIC via EBSCOhost. Google Scholar results also lead the researcher directly to online journals including*: Serials; The Journal of Academic Librarianship; and Journal of Digital Curation* and others. Keyword search strategy was used to source the results from different databases. Keywords used included: competencies; knowledge; awareness; skills; personal attribute; attitudes; perceptions. Keywords were also searched simultaneously using the Boolean operators (AND, OR, NOT) to refine the search strategy for desired results.

2.3.1 Open access in context

The World Wide Web, and especially the Internet, have contributed immensely to new initiatives that are technologically based. Christian (2008: 14) indicates that that these developments have made it easy for people to collaborate, produce, disseminate and share information all over the world regardless of their geographical location, social status, and economic background.

According to the *Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities* (2003), establishing open access requires the commitment of researchers, academics and each and every individual who produces scientific knowledge. Open access resources include research output, raw data, metadata, and scholarly multimedia material (*Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities,* 2003).

The open access concept is still new among researchers and academics from different geographic areas and research disciplines. A study carried out by Christian (2008) on issues and challenges to the development of open access institutional repositories in academic and research institutions in Nigeria compared institutions in Nigeria and South Africa. The findings of the study indicated that institutions in South Africa seems to be making better progress in planning and implementing of institutional repositories, while their counterparts in Nigeria seem to be making slow progress because they are bogged down by problems including: lack of knowledge of open access institutional repositories among researchers and academics in Nigerian research institutions; shortage of ICT infrastructure; lack of funding to support the institutional repositories projects; and lastly, insufficient advocacy and outreach programmes for open access in Nigeria (Christian, 2008: 28). Only a few respondents in this study indicated awareness of the institutional repository concept.

Creaser (2010: 4) undertook two surveys in 2008 "investigating the effects and impact of OA on research outputs in the United Kingdom (UK)". The institutional view from a survey of academic librarians was compared to researchers' perceptions and practices. The findings of the two surveys indicated that majority of the researchers maintained a view that open access publications are of low quality compared to publications in paid journals. Other researchers showed to have negative attitudes and perceptions about the institutional repositories concept. This shows that although open access as a concept has been around in the UK for years, there is still a need for people's mindset change about this concept.

It is evident then, that despite the powerful role of the Internet in the distribution of scholarly content, the OA concept is still not known in certain places. This could be because open access

initiatives are relatively new or because people have certain attitudes towards them. Perhaps staff in libraries do not have the necessary knowledge, skills and personal attributes required to run successful repositories. The present study attempts to ascertain the position of the BUAN academics in terms of the open access movement and its initiatives. The study also attempts to ascertain if staff at BUAN have the required knowledge and skills for the implementation of open access initiatives such as repositories.

2.3.2 The concept of institutional repositories

The open access movement gave rise to the development of institutional repositories to enable free and open access to information. According to Sutradhar (2006: 244) academic institutions have interest in the collecting and preserving their intellectual output and to share it freely on the Internet. Sutradhar (2006: 255) elaborates that the institutional repository concept does not just extend the service of a traditional library but has opened up a relevant and useful platform for academics to contribute and share their intellectual output among themselves within the institution and outside, without having any strain from publishers.

An institutional repository collects, preserves and makes accessible the intellectual output of an institution for long term use. This notion is corroborated by Bustos-Gonzalez, Fernandez-Porcel and Johnson (2007: 61) who point out that an institutional repository (IR) is understood to be a database that is designated to collecting, preserving, sharing the intellectual output of the university. This makes the repository a fundamental support tool for teaching, learning and research. It also increases the institution's visibility to the outside world. It is the university library that must lead the planning, establishing and implementing of the institutional repository to promote the university's educational effectiveness (Bustos-Gonzalez, Fernandez-Porcel and Jonson, 2007: 61).

A study by Stanger and McGregor (2006: 6) carried out at the University of Otago (New Zealand) on building New Zealand's first publicly available institutional repository revealed that an institutional repository could have a positive influence on the visibility and accessibility of an

institution's intellectual output when the content is made openly available to the whole world. They reported that the University of Otago (School of Business) was the first to develop an openly accessible institutional repository in 2005 and by the end of January 2006 there were 9000 downloads of articles from the repository from 60 different countries across the world. Two months later, the number of downloads doubled to 18, 744 and included visits from 80 countries. (Stanger and McGregor, 2006: 6). This report by Stanger and McGregor reflects how useful institutional repositories can be if they are fully functional and contents freely available.

Foster and Gibbons (2005: 1) conducted a study of academics' work practices to understand how academics operate to improve content gathering for the IR at the University of Rochester (New York). Their study focused on how academic members go about doing their research. This involved looking at how academics interact with digital tools and how they organise their work virtually and physically. The researchers used a "work-practice study" by observing and documenting of people at work. Their findings indicate that when they tried to harvest content using usual institutional repository promotional language, academics and researchers did not respond satisfactorily. The found that one the reasons why academics are not eager to put their work into the IR was that academics seem not to recognise the benefits of the institutional repository to them.

The reviewed literature thus far reflects that although institutional repositories face challenges they do seem to be the future affordable platform for scholarly communication. Hence a study on the institutional repository at BUAN could help inform BUAN staff on the planning and establishing of a successful institutional repository.

2.3.3 Themes emerging from the innovation-decision process

As indicated earlier (Section 2.3) it is useful for this study to review literature on themes emanating from Rogers's (1983: 164-185) DoI five-stage innovation-decision process.

2.3.3.1 Awareness, knowledge and skills in institutional repositories

A perusal of the literature shows that technology has altered traditional academic library functions. These dramatic changes have affected the knowledge, skills and other competencies of professionals working in this environment (Raju, 2014: 163). Several studies had been done around the world on staff awareness and knowledge of institutional repositories. Yang and Li (2015: 1) used a survey design to investigate academics at the Texas A&M University (Texas, United States of America (USA)) to investigate their knowledge of the institutional repository and ascertain their attitudes towards open access publishing and institutional repositories. The findings from the survey revealed that majority of responding Texas A&M University academics were aware of OA journals in their fields, and showed willingness to contribute by publishing in open access platforms. They also found that the low awareness of the institutional repository contributed to the low IR participation rate at Texas A&M University. Yang and Li (2015: 1) report that interestingly majority of participants appreciated the survey because it provided the respondents with Web links that were useful and enabled them to visit resources mentioned in the study and hence, they learned a lot about open access and institutional repositories from the survey. Yang and Li (2015: 1) further report that despite their best efforts to make academics aware of the abundance of resources made available by the libraries, it seems that their audience continues to remain unaware of some of the services and resources offered by the library. This serves to reinforce the need for continuous communication from library staff to faculty members. The Yang and Li (2015) study shows that awareness could be a challenge in the planning and establishment of successful institutional repositories and hence the importance of advocacy work.

A study carried out by Creaser et al. (2010: 153) using mixed methods research which involved a questionnaire and focus groups, reported that some participants in the study found the term repository confusing and expressed some difficulty in defining what a repository was and what sort of material it might hold; for example, whether it holds peer-reviewed articles, pre-prints, data, etc. Some respondents understood repositories to hold only working article papers or pre-prints, and some were not sure about the idea of submitting published articles to an institutional

repository (Creaser et al., 2010: 153). Such uncertainty was observed in each focus group and the free text responses provided by survey respondents often conflated repositories with journals in terms of an outlet for research dissemination (Creaser et al., 2010: 153). This study asserted that there is need for awareness about institutional repositories among academics and researchers to clear the confusion about repositories so that successful implementation of repositories may be achieved.

Nonthacumjane (2011: 284) in her paper about "key skills and competencies of a new generation of LIS professionals" used a qualitative research approach by doing content analysis of literature on skills and competencies of LIS professionals working in the digital era. Data was collected by analysing, quantifying, classifying and summarising the required skills and competencies which were mentioned or described in the literature including job advertisements (Nonthacumjane, 2011: 284). Nonthacumjane's data analysis described the key skills and competencies of a new generation of LIS professionals and classified them into three categories, namely: personal skills; generic skills; and discipline-specific knowledge. To elaborate on this three sets of skills, Nonthacumjane (2011: 6) describes discipline-specific knowledge as knowledge which is learned in LIS programmes at both undergraduate and postgraduate levels; for instance, collections development, information architecture and metadata, library management systems, metadata and metadata standards, etc. By generic skills Nonthacumjane refers to general skills that applies to all disciplines such as leadership skills, team work, information literacy and critical thinking skills. Personal skills comprise of the personal traits, perceptions and attitudes required by LIS professionals such as being self-motivated, flexible, creative, analytical, etc. (Nonthacumjane, 2011: 6).

Robinson (2008: 2) reports on knowledge and skills the SHERPA (Securing a Hybrid Environment for Research Preservation and Access) team created in staff and skills requirement document which may be used as a guide for knowledge and skills required to run successful institutional repositories. Robinson (2008: 2) explains that the document began in response to requests received by the core SHERPA team, for example, requests for job descriptions from advertised

repository posts. The development of the document has been greatly assisted by contributions from the SHERPA partners and UKCORR (The United Kingdom Council of Research Repositories) members. According to Robison (2008) the document enumerated the following knowledge, skills and abilities as key for the development of a successful repository: management, which includes ability to coordinate and manage activities of repository personnel and coordinate repository development with associated departments; software, which includes familiarity with Standard web-based software systems including (but not limited to) Linux, Structured Query Language (SQL) Server, MySQL, Standard Generalized Markup Language (SGML), Extensible Markup Language (XML), Hypertext Pre-processor (PHP), and JAVA; metadata skills, which includes familiarity with relevant metadata standards including (but not limited to) Dublin Core, Machine Readable Cataloguing (MARC), Metadata Encoding and Transmission Standard (METS), Metadata Object Description Schema (MODS), Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH); and Advocacy, Training & Support, which include the ability to develop an advocacy programme to address the full spectrum of stakeholders to create a broad culture of engagement within the institution. These competencies reported by Robison (2008) are relevant to the current study and informed its research instrument design in response to the study's critical questions. Since institutions vary in terms of how work of the repository is distributed, the current study looked into the competency requirements of BUAN academics and relevant support staff.

2.3.3.2 Attitudes and perceptions towards institutional repositories

The persuasion stage in the innovation-decision making process involves a process when an individual forms favourable or unfavourable attitudes and perceptions toward an innovation (Rogers, 1983: 172). The open access movement began over a decade ago, and hence one would assume that a large percentage of the members of academia, such as authors and users of open access resources, would be fully aware of the initiative and should embrace it enthusiastically. But this is not always the case.

As alluded to earlier in defining personal attributes (see Section 1.7.1.3), attitudes and perceptions are regarded as personal attributes and may have an effect in the planning and establishing of successful repositories. Raju (2014: 33) asserts that an "individual's personal attributes, that is, values, attitudes and personal traits, also impact on performance in the workplace". Raju elaborates that:

> Like generic competencies, personal competencies are not specific to a discipline or profession and may not be as critical as professional competencies, but nevertheless they are still necessary to form a blend of discipline-specific, generic and personal competencies required for LIS professionals to effectively and efficiently practice in a rapidly evolving, technology-driven academic library environment.

Raju reported extensively on personal attributes that may impact on performance in the work place. These personal attributes include: ability to work independently, ability to pay attention to detail, ability to work under pressure, initiative, responsibility, adaptability, dedication, commitment, intellectual curiosity, passion for technology, personal credibility, sound judgement and personal motivation.

Utulu and Bolarinwa (2009: 666), in their largely quantitative study on open access initiatives adoption by Nigerian academics, found out that 15% of the members of Nigerian academia were against the open access journals concept. Academics from two universities (that is, University of Ibadan and University of Lagos) were sampled using convenience sampling. The sampled academics were then surveyed using a questionnaire with closed questions to find out their awareness and level of use of open access initiatives as readers and authors of scholarly output. The findings revealed that although respondents were aware of the pre-print open access initiatives like institutional repositories and the post-print initiatives like open access journals, their awareness did not match with eventual use of these initiatives.

In terms of the use of open access initiatives, although the study revealed insignificant use among the academics, academics in the sciences showed more promise in adopting open access initiatives as authors and readers of scholarly resources than their counterparts in the humanities

(Utulu and Bolarinwa 2009: 666). The findings from this study show that disciplinary differences in author behaviour could also play a role in the use of IRs. The methodological approach and methods adopted by the study reported by Utulu and Bolarinwa (2009) and others covered in this literature review, were useful in determining the research design of the current study involving institutional repositories and staff at BUAN.

Reinsfelder and Anderson (2013: 485) surveyed library directors to investigate the nature of any relationship between the actions of academic administrators and an institution's commitment to open access, as observed by librarians. Their findings reveal that the decisions authors make about how and where to share their work contribute greatly to the scholarly communications environment and the success of repositories. They also report that awareness of open access possibilities continues to rise among faculty researchers but the concept is still new to many. This might be the reason for slow adoption of open access initiatives such as institutional repositories. Reinsfelder and Anderson conclude by saying that the attitudes and perceptions authors have about open access initiatives impact on their decisions to participate in institutional repositories.

Obuh (2013: 154), in his Nigerian study on attitudes towards the use of open access scholarly publications, reveals that better understanding of authors' attitudes and perceptions regarding open access of scholarly publication is essential for successful planning and establishing of institutional repositories. Obuh's study examined Library and Information Studies lecturers' attitudes towards open access scholarly communication in southern Nigeria. The study used a descriptive survey design to collect data from respondents and found that junior academic staff use open access initiatives more than their senior counterparts. The study shows that age might be a contributing factor in attitudes towards open access and use of institutional repositories.

In a similar African study Mammo and Ngulube (2015: 17) examined academics' use of and attitude towards open access in selected higher learning institutions in Ethiopia. Their study triangulated qualitative and quantitative data collection methods. They used questionnaires and semi-structured interviews to collect data. The results of the study revealed that majority of

academics were aware of open access journals. Their findings also show that academics perceived positive attitude towards open access journals and would like to use them in future. Moreover, their results indicate that academics have been using open access journals as an alternative model to the subscription journals model; but to elevate the benefits of open access among academics, they expect academic librarians to promote and enhance the accessibility of open access journals in their respective university libraries in Ethiopia and in general. African academics are aware of institutional repositories and some are already using them as alluded to by Mammo and Ngulube (2015: 17).

Meanwhile Tarrago and Molina (2008: 19) found differently in their Cuban study to assess knowledge and attitudes towards open access journals. They used a cross sectional survey to examine the knowledge and attitudes of Cuban researchers about open access by providing the participants in the study with a list containing the main initiatives and terms associated with the open access movement literature published on this topic. These lists were presented in the form of a questionnaire. The study revealed that generally, knowledge about the terms in the lists was found to be scarce, hence leading to the assumption that awareness might be playing a key role in Cuban researchers not fully adopting open access initiatives. And yet Mammo and Ngulube's (2015: 17) study showed differently in their Ethiopian investigation. Hence the importance of conducting a country specific study for Botswana in order to understand the differences across different research environments, so as to come up with proper strategies for effective planning and establishment of a successful institutional repository at BUAN.

Hahn and Wyatt (2014: 93) surveyed the business faculty at the University of Oklahoma in the USA to determine their attitudes toward institutional repositories and other types of repositories. Their study revealed that most of the academics were unaware of institutional repositories at their institutions. However, approximately one third are using disciplinary repositories and are receiving encouragement from their departments to do so. The respondents in the study revealed that open access journals are viewed as lacking prestige and as being lower quality publications in the business field due to the lack of prestigious publishers and editors. Many faculty academics expressed that their prestige would fall if they published in an open access

journal. This same attitude could influence academics in terms of depositing in institutional repositories (Hahn and Wyatt, 2014: 93). Could a similar perception be a cause of low deposit by academics into the IR at BUAN? Herein lies the value of this study to ascertain if a comparable situation exists in Botswana.

Jain, Bentley and Oladiran (2009: 4), in their paper examining the role of institutional repositories in digital scholarly communication in the African context, identified some challenges associated with institutional repositories. They identified difficulties in generating content. Authors' attitudes were also seen as a challenge, because a successful institutional repository depends on the willingness of authors to deposit their work.

The literature in this section indicates that even though academics are aware of open access initiatives there is still low usage and adoption of open access initiatives. This is an indication that attitudes might be playing a key role in the adoption and use of institutional repositories by academics. No research has been done in Botswana on the role personal attributes play in the planning and establishment of institutional repositories. Hence this study attempts to ascertain, *inter alia*, whether personal attributes like attitudes and perceptions play a role in the planning and establishment of an institutional repository at BUAN.

2.3.3.3 Adoption and implementation of institutional repositories

Although institutional repositories are a relatively new innovation some universities have fully established and implemented successful repositories. Moahi (2009: 3) reported that in 2009 that two registers of institutional repositories, ROAR (Registry of Open Access Repositories) and OPENDOAR (Directory of Open Access Repositories), listed over "1000 institutional repositories in the world; and worryingly 20 of them are in Africa, and mostly South African universities and only one in Botswana at the University of Botswana". Since 2009, these numbers are likely to have grown.

Institutional repositories are becoming a common place among academic institutions to share knowledge. Stellenbosch University in South Africa "is not exempt from this public good practice"

(Raju et al., 2012: 16). Like many other academic institutions, Stellenbosch University created its repository to capture, organise and disseminate its theses and dissertations output (Raju et al., 2012: 16). These authors explain that despite the perceived success of Stellenbosch University's library and information service in this new era of open access publishing, they are of the view that the "road is never ending" as new challenges and opportunities would present themselves and would need to be embraced. This was revealed in the findings of the case study they undertook to examine the initiatives of Stellenbosch University Library towards open access.

Moahi (2009: 6), writing in a Botswana context, posits that contrary to what is believed, implementing an institutional repository is not a matter of obtaining software and hardware, and waiting for content to flood in; it is more about the users and how they appreciate the need and use of an institutional repository. This notion is further corroborated by Kinsley (2008: 216) who makes the point that institutional repositories have not had as much success as discipline-based repositories because they are centralised systems where decisions about the implementation are imposed from the administration.

The literature reviewed in this section indicates that while some academic institutions are still struggling with implementation of institutional repositories, other universities have moved forward with this development. Based on the researcher's experience and what is available in the literature, Botswana seems to be lagging behind at the level of adoption and use of institutional repositories. Hence research relating to the implementation of a successful repository would contribute to the empowerment of the country and the region in terms of measures that could help in the planning and establishing of successful institutional repositories. Such research could also help to come up with strategies to market institutional repositories for adoption by academics.

2.3.3.4 Reinforcing institutional repositories for future use

In the innovation-decision process Rogers (1983: 185) explains that once individuals have adopted an innovation they seek reinforcement to stick with the decision they made because

they might reverse those decisions if they are exposed to conflicting messages about the new innovation. Hence it is important to support such individuals to fully adopt the innovation.

This notion is supported by Dulle, Minishi-Majanja and Cloete (2010: 62) who point out that the motivation to publish in open access initiatives may be affected by several factors including: their institutions support structures, funding agencies or even their colleagues in the research community. They investigated "factors affecting the adoption of open access in research activities within Tanzanian public universities" with an aim of developing strategies for improving the use of institutional repositories. Dulle, Minishi-Majanja and Cloete (2010) used a questionnaire to collect data from the sampled population. The findings from their study indicate that improvement in technology infrastructure could help in the establishing and implementation of successful repositories. They further recommend that organisations could motivate their employees through providing necessary Internet infrastructure and training them how to use the technology.

Some universities have put in place firm policies to facilitate depositing of resources into the repository. According to Raju and Raju (2009: 5) the process of depositing at Stellenbosch University (South Africa) is less labour intensive because the University Senate took a decision in April 2007 to mandate submission of e-copies of each postgraduate theses or dissertations, making this the first institution on the continent to make this mandatory.

Obuh (2013: 154) in his Nigerian study on attitudes towards the use of open access scholarly publications recommends that management should equip their institutions with enabling infrastructure for open access and reward systems could be put in place to motivate academics to publish in open access initiatives.

Meanwhile Moahi (2009: 6) explains that although publishers might allow depositing pre-prints or even the final print into institutional repositories, many authors are not aware of their rights and do not have the time to find out what rights they have regarding their published papers. She suggests that educating authors about copyright issues could also encourage authors to deposit

in institutional repositories. Clarity on copyright issues to authors could enhance the success and adoption of institutional repositories.

A study carried out by Watson (2007: 229) at Cranfield University (UK) on authors' attitudes, awareness and use of university institutional repository, suggests that to address some of the issues regarding attitudes, awareness and use of institutional repositories, institutions should try to fully integrate institutional repositories into the research process. He indicates that rather than putting the focus on the repository, the focus should be on the researcher and the research process, by providing support services to the researcher throughout the research process from the beginning till the end (Watson 2007: 229).

The literature reviewed in this section indicates that institutional policies and guidelines could assist in achieving a successful institutional repository. Reward systems could also aid adoption of institutional repositories by academics and provision of reliable Internet infrastructure could also help.

2.4 Summary

This chapter discussed the theory supporting the study, that is, the innovation-decision process of the Diffusion of Innovations theory (Rogers, 1983: 164). Related studies were reviewed in the context of the innovation-decision process and guided by the study's critical questions. Most of the reviewed studies adopted a survey method and used questionnaires to collect data, and provided useful results for this study which adopted a similar methodological approach. However, most of the reviewed studies were conducted in countries other than Botswana. Hence the importance of conducting a specific study in Botswana in order to compare and contrast with other research environments to come up with strategies that could help achieve the effective planning and establishing of an institutional repository at BUAN. The next chapter presents the study's research design and methods.

Chapter 3: Research design and methods

3.1 Introduction

In re-iteration, the main objective of the study was to ascertain staff competencies in the planning and establishing of an institutional repository at BUAN. The critical questions generated to address this objective included: What knowledge, skills and personal attributes are required in the planning and establishing of a successful institutional repository in an academic institution?; Do BUAN staff have the knowledge, skills and personal attributes necessary for planning and establishing a successful repository?; How significant a role do personal attributes such as attitudes and perceptions play in the planning and establishment of an IR at BUAN?; and, What measures may be put in place to reinforce the planning and establishing of an institutional repository at the BUAN Library.

3.2 Research paradigm

A research paradigm is a "model or framework for understanding which shapes both what we see and how we understand it" (Babbie, 2004: 33). The research paradigm suitable for this study was the pragmatic world view because the researcher collected different types of data to provide a more complete understanding of the research problem (Creswell, 2014: 19). With the pragmatic world view, the researcher collects both quantitative and qualitative data (Creswell, 2014: 19). According to Creswell (2014: 11) pragmatism is not committed to any one system of philosophy and reality; researchers are free to choose the methods, techniques and procedures of research that best meet their needs and purpose. Mixed methods researchers look to many approaches for collecting and analysing data rather than subscribing to only one approach (for example, quantitative or qualitative) and thus for the mixed methods researcher, pragmatism opens the door to multiple methods, different worldviews and different assumptions as well as different forms of data collection (Creswell, 2014: 19). Thus, this study adopted the pragmatic world view which allowed it to use mixed methods to collect data which was done concurrently (Creswell, 2014: 11) using both quantitative (questionnaires) and qualitative (interviews) instruments.

3.3 Research design

A research design is a plan, structure and strategy of investigation so conceived as to obtain answers to research questions or problems (Kumar, 2005: 84). Kumar further states that the traditional research design is a blue print or detailed plan for how a research study is to be completed, operationalising variables so they can be measured, selecting a sample of interest to study, collecting data to be used and analysing the results.

This study employed a mixed methods design by using both quantitative and qualitative research approaches. According to Creswell (2014: 14) mixed methods involves combining or integration of quantitative and qualitative research data in a research study. Creswell further explains that qualitative data tends to be open-ended without predetermined responses while quantitative data usually includes closed responses such as ones found in questionnaires or psychological instruments. This study used convergent parallel mixed methods where both qualitative and quantitative data were collected at the same time. Creswell (2014: 15) explains that in this design the researcher typically collects both forms of data at the same time and then integrates the information in the interpretation of the overall results. This notion is corroborated by the Centre for Research and Innovation (2017) by explaining that in this design, qualitative and quantitative data are collected concurrently in one phase. The data is analysed separately and then compared and/or combined. This method is often used to overcome a weakness in one method with the strengths of another to offer a broad and complete analysis of the research problem (Centre for Research and Innovation, 2017; Babbie, 2016: 411; Ngulube, 2015: 127). In this study, quantitative data were collected using closed questions from the questionnaire while qualitative data were collected using interviews and a few open-ended questions in the questionnaire to offer a broad and complete analysis of staff competencies in the planning and establishing an of institutional repository at BUAN.

3.4 Research approach

The study employed a case study approach. Creswell (2014: 14) explains that “case studies are a design of inquiry found in many fields, especially evaluation, in which the researcher develops an

in-depth analysis of a case often a programme, event, activity, process, or one or more individuals". He elaborates that cases are often bounded by time and activity, and researchers collect detailed information using a variety of data collection procedures over a sustained period (Creswell, 2014: 14). This definition is corroborated by Yin (2009: 19) who defines a case study as an empirical inquiry that investigates a contemporary phenomenon in depth and within its real context especially when the boundaries between the phenomenon and context are not clearly evident. Yin (2009: 11) further states that a case study is preferred in examining contemporary events. Punch (2014: 120) posits that the basic idea behind case studies is that one case will be studied in detail using whatever methods and data seem appropriate. While there are specific purposes and research questions, the general objective is to develop as full an understanding of this case as possible. This study adopted a case study approach because the researcher undertook an in-depth enquiry into staff competencies in the planning and establishment of a repository at BUAN for better understanding of this case.

3.5 Research methods

Research methods involve the forms of identification of the study population, sampling techniques, data collection instruments, data analysis techniques and data interpretation (Creswell, 2014: 16).

3.5.1 Study population

The study population is a group of people from which you select a few or all to question to find answers to your research questions (Kumar, 2005: 165). For this study, the population included BUAN academics and relevant support staff dealing with the institutional repository. BUAN has 201 academic staff from all six academic departments (Botswana University of Agriculture and Natural Resources, Human Resource office, 2017). The University library has three (3) library staff responsible for managing the repository. These staff members include: Senior Librarian (Information Systems) who is currently the Repository Manager, one (1) Assistant Librarian and one (1) Library Officer. The repository is managed by the Special Collections Section of the Library. The University Information Technology (IT) Department has seven (7) staff members. For

relevance to the issue under investigation only two (2) IT staff members were interviewed, that is, the IT Manager who is responsible for decision making of what goes into which server and he oversees all operations of the IT department, including the institutional repository based in the University library. One (1) IT staff member who is assigned to handle day-day Library IT operations was also interviewed. Hence this study's population consisted of 201 academics from six academic departments, three (3) members of the Library staff responsible for the repository and two (2) IT staff providing IT support for the repository (see Table 3.1)

Table 3.1: Study population

Population	Population size
BUAN academics	201
Library repository staff	3
Information Technology staff	2

3.5.2 Sampling

Sampling is the selection of research participants from the entire population, and involves decisions about which people, settings, events and social process to observe. Who and what will be sampled in a study is influenced by the unit of analysis (Kelly, 2006: 287). For the quantitative aspect of the study (questionnaire survey) a census was conducted of all 201 academic staff members. Some advantages of a census include: providing a true measurement of the population (no sampling error); benchmark data may be obtained for future studies; and, detailed information about small sub-groups within the population is more likely to be available (Australian Bureau of statistics, 2013). A census of all 201 BUAN academic staff members was decided on because as a newly established independent university, there is much staff development taking place at BUAN and therefore many academics are away training - hence the questionnaire might not have received an adequate response if a sample was targeted. The transformation of the University has also occupied academics, many of whom are involved in committees within the university to drive the transformation process, and so might not be available to respond to the questionnaire. A further reason for doing a census of all 201

academics was the possibility that some academics might be on sabbatical or other leave. For those reasons, it was important to conduct a census of all academics in the interest of securing a maximum return rate on the questionnaire.

For the study's qualitative aspect, the study adopted a non-probability sampling technique, that is, judgmental or purposive sampling, was adopted. According to Neuman (2006: 222) purposive sampling is a valuable kind of sampling for special situations whereby the judgment of an expert is used in selecting cases with a specific purpose in mind. This is corroborated by Kumar (2005: 179) who explains that the main consideration in purposive or judgmental sampling is the judgment of the researcher as to who can provide the best information to achieve the objectives of the study because in purposive sampling, the researcher only goes to those people who in his/her opinion are likely to have required information and be willing to share it.

Three (3) library repository staff were purposively sampled because of their association with the institutional repository: Repository Manager; one (1) Assistant Librarian and one (1) Library Officer. Two (2) IT staff members were also purposively sampled because of their roles and responsibilities with the repository. This included: IT Manager because he is responsible for the decision making in the University IT Department and he oversees the IT operations including those of the library; one IT Officer designated to manage library operations including the IR (See Table 3.2).

Table 3.2: Census and sample

Target population	**Population size**	**Census**
BUAN academics	201	201
		Sample size
BUAN library staff	21	3
BUAN Information Technology staff	7	2

3.5.3 Data collection

Data was collected from the Botswana University of Agriculture and Natural Resources (BUAN) academic staff and relevant support staff members. The study employed multiple data collection instruments appropriate for data collection within each group of the identified population. The study used semi-structured interviews to collect data from purposively selected library staff and Information Technology (IT) staff and a questionnaire was administered to academics. Table 3.3 summarises data collection methods applied to each critical question, relevant DoI theory concepts applicable and data analysis strategies.

Table 3.3: Mapping the critical questions to sources of data and data analysis strategies

Critical question	Relevant DoI theory concept	Data source/method	Data analysis strategies
1. What knowledge, skills and personal attributes are required in the planning and establishing of a successful institutional repository in an academic institution	Knowledge, skills about an innovation	Relevant Literature Library repository staff	Thematic content analysis Thematic content analysis
2. Do BUAN staff (academics and relevant support staff) have the knowledge, skills and personal attributes necessary to plan and establish a successful repository?	Persuasion	Academics (questionnaires) Library repository staff (interviews) IT staff (interviews)	Descriptive statistics Thematic content analysis
3. How significant a role does personal attributes such as attitudes and perceptions play in the planning and establishment of an IR at BUAN?	Personal attributes (perceptions, attitudes, etc.)	Academics (questionnaire) Library repository staff (interviews) IT staff (interviews) Relevant literature	Descriptive statistics Thematic Content analysis Thematic content analysis
4. What measures may be put in place to reinforce the planning and establishment of an institutional repository at the BUAN Library?	Implementation and reinforcement	Relevant literature Academics (questionnaire) Library repository staff (Interviews) IT staff (Interviews)	Thematic content analysis Descriptive statistics Thematic content analysis

3.5.3.1 Questionnaires

The research instrument used to collect data from academics in this study was a self-administered questionnaire, which included a few open-ended but mainly closed questions (see Appendix C). According to Kumar (2005: 132) an open-ended question is where the respondent writes down the answers in his or her words, while with the closed question, the pre-determined responses are set in the questionnaire. The study used a questionnaire because it was easier to reach out to BUAN academics at low cost by means of a questionnaire (Pickard, 2013: 207). The questionnaire was self-administered by academics without assistance from the researcher which gave the respondents freedom in responding to the questionnaire. The questionnaires were, for maximum return, distributed physically to academic staff offices. A Google document was created for academics who were not physically in BUAN during data collection to administer the questionnaire online. Questionnaires were also emailed to academics, where requested.

3.5.3.1.1 Questionnaire design

The questionnaire (see Appendix C) included statements and possible responses which quantitatively probed staff competencies in the planning and establishing of the institutional repository at the BUAN. The questionnaire had items ranging from independent variables (awareness, knowledge, skills and personal attributes) to dependent variables (use and adoption). The design of the questionnaire was guided by the study's critical questions and informed by both the literature reviewed and themes emanating from the innovation-decision process of the DoI theory guiding the study. The questionnaire was completed anonymously. The questionnaire had a preamble explaining the nature of the study, objective, purpose, assuring confidentiality, anonymity and voluntary participation (see Appendix C). It was logically structured into sections and sub-sections with guidance from the study's critical questions, literature reviewed and the innovation-decision process from the DoI theory.

3.5.3.2 Interviews

The qualitative aspect of the study used interviews to collect data from participants. Kumar (2005: 123) describes an interview as any person-to-person communication between two or

more individuals with a specific purpose. Punch (2014: 144) states that an interview is an effective way of "accessing people's perceptions, meaning, definitions of situations and constructions of reality". This study adopted both methods of interviewing by using semi-structured interviews. The strength of unstructured interviews is the freedom they provide in terms of content and structure while in structured interviews, the researcher asks a pre-determined set of questions using the same wording and order of questions as specified in the interview schedule (Kumar 2005: 123). For convenience purposes and to gather more information while at the same time not getting off context the researcher used both structured and unstructured interview aspects. This provided the researcher with some freedom when administering the interviews but at the same time staying focused on the context while administering the interview. The semi-structured interviews with the purposively sampled library repository staff and IT staff were informal in setting to encourage conversation yet still abiding to an interview schedule (see Appendices D & E).

3.5.3.2.1 Interview schedule design

An interview schedule was designed informed by the innovation-decision process of the DoI theory (Rogers, 1983: 185) and the study's critical questions, to guide the direction of the interview. The interviewees were given the informed consent forms (see Appendices A & B) five days before the interview to allow them time to prepare for the interview and sign the forms to indicate that they consent to being interviewed. By signing the consent forms, the interviewees were informed that they will be granting the researcher an interview session with them. For accurate capture of data collected, the interviewees were informed that the sessions will recorded (with permission from them) using a digital audio recorder. Questions asked in the interview schedule related to the study's objective. Interviewees were informed that information collected from them will be treated with utmost confidentiality by anonymising of data during the reporting process. Participation was voluntary and interviewees were informed that they may withdraw at any stage in the research process. Two informed consent forms, one for BUAN library repository staff (see Appendix A) and the other one for BUAN IT staff (see Appendix B),

were produced. Two separate interview schedules, one for library repository staff (see Appendix D) and one for IT staff (see Appendix E), were also produced.

3.5.3.3 Pre-testing of data collection instruments

Pre-testing refers to the process of testing the reliability and validity of research instruments (Abbott & McKinney, 2013: 406). Pre-testing instruments enables the researcher to figure out the following: to clear ambiguity and ensure that the language is clear; to ensure that the instruments collect the data they are intended to; and to ensure that questions asked are simple and not complicated (Thomas, 2004: 108-109).

Pre-testing of the quantitative instrument was done at the University of Botswana (UB). Ten respondents were used to pre-test the questionnaire which was delivered through a colleague who is a Librarian in the Faculty of Health Sciences at the University of Botswana. The pre-testing took one week to complete. Participants were selected at random by the colleague based on their availability. Participants initially commented on the length of the questionnaire but then realised that it was highly structured and went ahead to complete it. There were no changes required after pre-testing.

The same colleague who delivered the pre-testing questionnaires at UB was used to pre-test the interview schedule designed for library repository staff. This participant was selected because he is a former employee of the BUAN Library and had at some point worked with the BUAN Institutional Repository. The interview session was conducted in the same manner as the ones conducted on library repository staff. Issues regarding IR policy formulation, and training of staff surfaced during the interview. No adjustment to the interview schedule was required. The design of the interview schedule for IT staff was very much the same as the one for library repository staff, and so it was deemed not necessary to conduct a pre-test interview.

3.5.3.4 Administering of research instruments and return rate

As mentioned earlier, for maximum return, the researcher distributed the questionnaire by hand to offices of academics and, where necessary, some questionnaires were left with secretaries in the departments to pass to the academics. Follow-ups were done after every two days to ensure that the questionnaires are being administered. As already mentioned, the questionnaire was also delivered via the Web by providing a Web link to the questionnaire in Google document format, for academics on training to respond to. If requested, the questionnaire was also emailed to individuals. The respondents were given roughly four weeks to complete the questionnaire. Email notifications were sent to departmental secretaries at regular intervals for follow-up on the progress of administering the questionnaire. During this time, the researcher also conducted the interviews with identified Library repository and IT staff. Data collection for this study began at BUAN on 15 October 2017 and 'ended' on 21 November 2017 (but the researcher permitted completed questionnaires to come in even after this date, to encourage more returns). Despite rigorous efforts for maximum return rate on the questionnaires, of the 201 targeted academics (see Table 3.2) the researcher managed to access 120 academics to whom questionnaire were delivered in one form or another. Of the 120 delivered 108 were returned, giving the study a return rate of 54% on the questionnaire for academics.

Appointments were made with the interviewees prior to the interviews at which point the consent forms were administered. One-on-one interviews were conducted with the purposively sampled library repository staff. The three purposively sampled respondents were interviewed on separate days and a digital audio recorder (with permission built into the consent form) and note book for field notes were used to capture the proceedings of the interview. The same strategy was applied on the two purposively sampled IT staff. Two interviews with the library repository staff were on the 16 October 2018 while the other one was conducted on the 23 October 2017. The two interviews with IT staff were conducted on 24 October 2018, in the morning and afternoon, respectively. The interview with the library repository manager lasted about 30 minutes, while the interview with second library repository staff member took 37 minutes and with the third library repository staff member, 19 minutes. The interviews with the IT staff did not take long; they took an average time of 15 minutes each. The researcher did not

record the time for the interviews with BUAN IT staff because they did not agree to the interview being recorded.

3.5.4 Data analysis

Data collected using the quantitative instrument (questionnaire) administered to academics were analysed using *Microsoft Office* tools (that is, *Microsoft Excel* and *Microsoft Word*). *Microsoft Excel* was used to generate bar graphs and pie charts while *Microsoft Word* was used for tables and narratives. Data was cleaned and coded by hand and presented according to the critical questions and the innovation-decision process of the DoI theory informing the study (Rogers, 1983, 164). The findings were then compiled into frequency distribution tables, pie charts, bar graphs and cross tabulations used to determine the interrelationship between variables. For responses to the few open-ended questions in the questionnaire, the researcher undertook thematic content analysis and generated frequency distribution tables and subsequently looked for any patterns within these responses that yielded additional information on the attitudes of academic staff towards open access initiatives. Thematic content analysis was also carried out on responses from the semi-structured interviews that were conducted with the library repository staff and IT staff. When reporting on the analysis, data were concurrently integrated by embedding responses from the interviews with library and IT staff together with the responses from the primary source of data (questionnaire) and vice versa. The different sets of data collected were not used for validation but instead to supplement one another in order to broadly and completely understand staff competencies in the planning and establishing of an institutional repository at BUAN (Centre for Research and Innovation, 2017; Ngulube 2015, 128; Blanche, Durrheim and Painter, 2006: 380).

3.6 Reliability and validity

Testing for reliability and validity is about assessing the qualities of an instrument designed for use in research. Punch (2014: 237) indicates that reliability basically means consistency of the research instrument. This consistency can be consistency over time or internal consistency. According to Punch consistency over time (or stability) means the stability of the measurement

over time. To ensure this form of reliability the researcher pre-tested the data collection instruments (questionnaires and the interview schedules), before administering to the main population. The interview proceedings were recorded (with permission) so that the responses from the participants were accurately captured. The statements in the questionnaire were clearly crafted and the researcher avoided ambiguity. Closed questions were mostly used to avoid gathering irrelevant information from respondents. The contact details of the researcher were included in all questionnaires if the respondents needed clarification when completing the questionnaire.

For this study, validity was applied to the study's data collection instruments. According to Punch (2014: 239) a central concept in quality measurement is validity. Thus, according to Punch measurement validity means the extent to which an instrument measures what it is supposed to measure, that is, an indicator is valid to the extent that it empirically represents the concepts it purports to measure. To achieve validity in the study the researcher used more than one instrument to collect data (questionnaires and interviews) to ensure that all critical questions guiding the study were adequately addressed and to see if they were correlations in the responses among BUAN academics, BUAN library repository staff and BUAN IT staff. This practice in research is referred to as triangulation. Triangulation involves collecting data in as many ways as possible and from as many diverse sources as possible (Kelly, 2006: 287). This can help researchers to have a better understanding of a phenomenon by approaching it from several different angles (Kelly, 2006: 287).

3.7 Ethical Considerations

Research ethical considerations are an integral part of the research design process. It is important to highlight the ethical considerations regarding the research. An ethical aspect is the issue of confidentiality of the results and findings of the study and the protection of participants' identities. This could include obtaining letters of consent, obtaining permission to be interviewed, providing incentives, seeking sensitive information and maintaining confidentiality. It is

important for the researchers to familiarise themselves with the ethics policy of the relevant institution (Maree, 2007: 41)

In this study, the participants were allowed opportunity to authorise their participation in the study, by completing consent forms. The participants were given five days to decide if they want to participate in the study or not. Participants were informed of the nature of the research and their involvement in advance. They also had a section in the informed consent form where they can agree or disagree with the interview being recorded. The confidentiality of the participants' responses was highlighted in a questionnaire preamble where respondents were assured that data collected will be kept confidential by making the questionnaire respondents anonymous and that information collected will be treated with utmost confidentiality by anonymising of data during the reporting process. To maintain confidentiality among interview respondents, the names of the interviewees remained confidential during the reporting of findings and any information linking to the identity of an interviewee was removed. Participants were also informed that they may withdraw participation in the research at any point. It was made clear that participants in this study will not receive any incentives for responding to the questionnaire, and will not receive direct benefit from the outcomes of the study. Ethics clearance was obtained from University of Cape Town (where the study is registered) and BUAN (the study's research site).

3.8 Evaluation of research methodology

The pragmatic paradigm was suitable for this study, as it enabled the researcher to collect diverse types of data from BUAN academics, library repository and BUAN IT staff which yielded useful information on the knowledge, skills and personal attributes that BUAN staff required in the planning and establishing of a successful institutional repository at BUAN. The convergent parallel mixed methods design allowed the researcher to use quantitative and qualitative instruments concurrently to collect data from academics and purposively sampled library repository staff and IT staff. The purposive sampling enabled the researcher to collect data from relevant staff in the library and IT department. A case study approach proved useful for collecting

a variety of data for better and deeper understanding of the single case of BUAN in order to understand its staff competencies in the planning and establishing of an institutional repository. Admittedly, the target population on the side of academics proved to be a challenge, as BUAN academics were difficult to access. However, return rates on questionnaires are always a challenge and in this case the just over 50% return rate meant that findings could still be reflective of the BUAN academic population. The purposively sampled library repository staff and IT staff proved to be suitable for this study. While some of the academics complained about the length of the questionnaire, the researcher is firm in his belief that it was the correct decision not to sacrifice depth of data collection for brevity of data collection instrument. The fact that the pre-tests did not require adjustments of the instruments is testimony to the care taken in the clarity and design of the instruments in response to the critical questions guiding the study as well as the innovation-decision process of the DoI theory and literature informing it. Descriptive statistics and thematic content analysis used in the analysis of qualitative and quantitative data, respectively, allowed for clear presentation of findings. On the whole, despite challenges encountered along the way which were resourcefully and creatively problem-solved, the researcher is confident that the methodology adopted for the study facilitated the collection of appropriate data to respond to the critical questions generated to address the study's objective and research problem relating to ascertaining staff competencies in the planning and establishing of an institutional repository at BUAN.

3.9 Summary

This chapter presented the pragmatist research paradigm in which the study was located. Its mixed methods research design, case study approach and specific research methods were also outlined. The chapter explained the study's population as well as its sampling methods, where necessary. Data collection instruments used were detailed. Data analysis, reliability and validity of data collection instruments, ethical considerations, and evaluation of methodology used, were also presented in this chapter. The next chapter presents the findings from the study.

Chapter 4: Presentation of findings

4.1 Introduction

Chapter 3 presented the study's research design and methods. This chapter presents the findings of the study. The main objective of the study was to ascertain staff competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources (BUAN). Critical questions generated to address this objective included: What knowledge, skills and personal attributes are required in the planning and establishing of a successful institutional repository in an academic institution?; Do BUAN staff have the knowledge, skills and personal attributes necessary for planning and establishing a successful repository?; How significant a role do personal attributes such as attitudes and perceptions play in the planning and establishment of an IR at BUAN?; and, What measures may be put in place to reinforce the planning and establishing of an institutional repository at the BUAN Library?

The critical questions were responded to by means of empirical data collected using a questionnaire from a census conducted of BUAN academics and interviews conducted with purposively sampled BUAN library repository staff and IT staff. Mapping of the critical questions to the sources of data and data analysis strategies are presented in Table 3.3 in Chapter 3. Details about the expected return rates are reflected in Table 3.2 in Chapter 3. The structured questionnaire (see Appendix C) was designed for a target population of 201 BUAN academics. The researcher managed to access 120 BUAN academics to whom questionnaires were distributed. Of the 120, 108 were returned while 12 were not returned. The 108 responses out of the targeted 201 BUAN academics gives the study a satisfactory response rate of 54%, despite efforts outlined in Section 3.5.3.4 of Chapter 3. According to Relmer and Ryzin (2011: 10) if results of this nature only apply to the exact setting (time, place and circumstances) in which the study was conducted, they may be generalised to the particular setting (in this case the Botswana University of Agriculture and Natural resource). In terms of the qualitative aspect of the study the study, all five interviews (three purposively sampled library repository staff and two purposively sampled BUAN IT staff) were successfully conducted.

4.2 Presentation of findings

The findings are presented in the sequence of the critical questions listed earlier in this chapter and in relation to the five-stage innovation-decision process from the Diffusion of Innovation theory (Rogers 1983: 164) informing the study. Biographical information for all respondents is presented first followed by presentation of the empirical data in relation to the critical questions. The findings from the quantitative instrument (Questionnaire, Appendix C) are presented first under each critical question followed by findings from the qualitative instruments (Interviews, Appendices D and E). For easier readability, percentage counts are rounded off to the nearest whole and therefore sometimes aggregation might reflect 99% or 101%. Both types of data were reviewed and consolidated, where necessary, through narratives. Where relevant such narratives were guided by the theoretical perspective of the study (Centre for Innovation in Research and Training, 2017).

4.2.1 Biographical information

This section presents the biographical information for academics, library repository staff and information technology (IT) staff.

4.2.1.1 Academics' biographical information

Academics were asked to provide biographical information that related to the study.

4.2.1.1.1 Academic departments

Respondents were asked to indicate the academic department they are members of. Academics had to choose from the six academic departments that BUAN has (see Appendix C). It is not surprising that the biggest percentage (22%) of the 108 respondents who completed the questionnaire come from the Animal Science and Production (ASP) department because ASP is the largest academic department in BUAN. Food Science and Technology which is a newly formed department registered a low percentage (8%) of respondents. It is encouraging to record that all

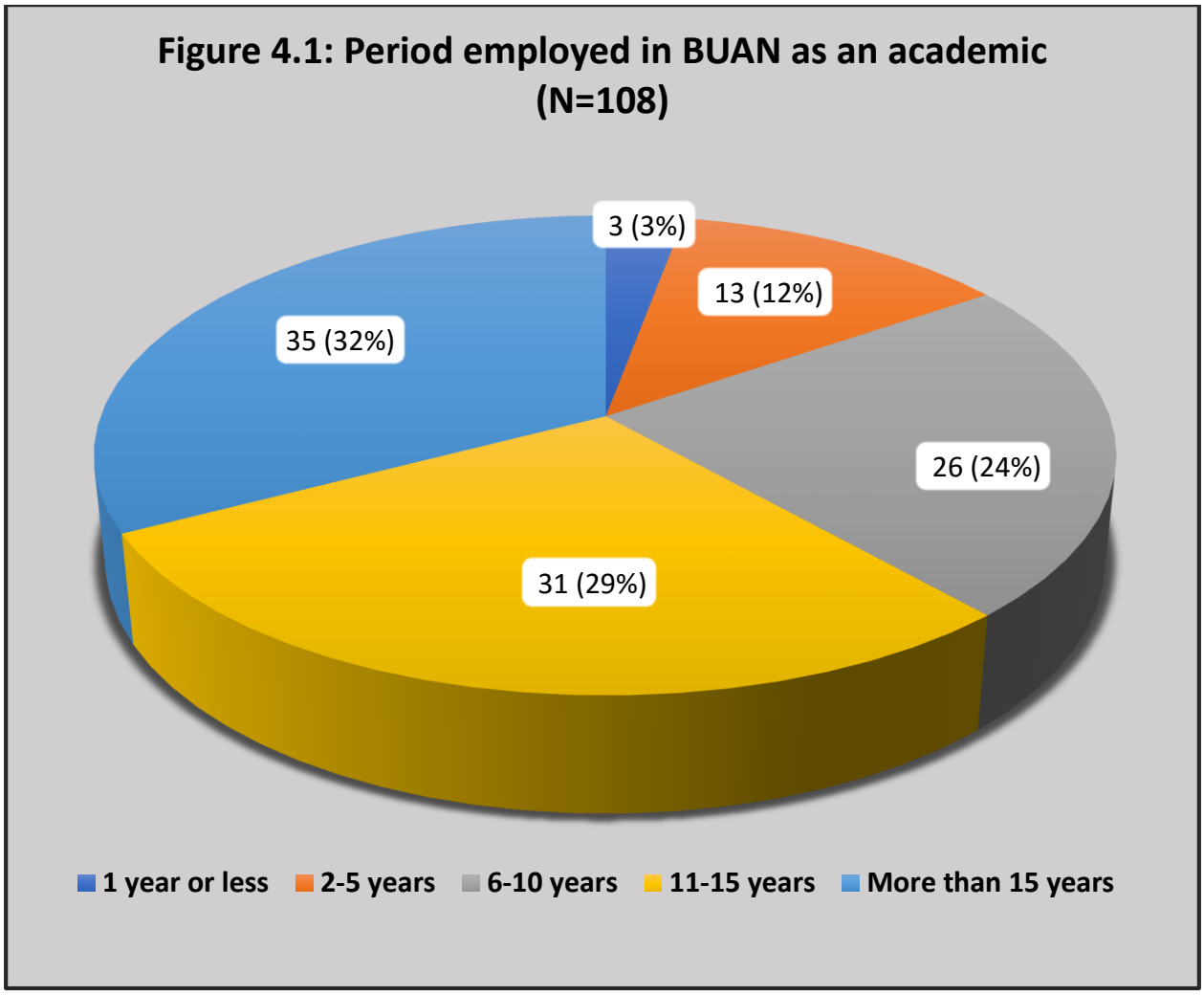
six academic departments in BUAN are represented in this study. Table 4.1 captures the academic departments which respondents are members of.

Table 4.1: Academic departments (N=108)

Academic department	Number of respondents	Percentage distribution
Animal Science and Production (ASP)	24	22%
Basic Sciences (BS)	21	19%
Crop Science and Production (CSP)	20	19%
Agricultural Engineering and Land Planning (AEL)	19	18%
Agricultural Economics, Education and Extension (AEE)	15	14 %
Food Science and Technology (FST)	9	8%
Total	**108**	**100%**

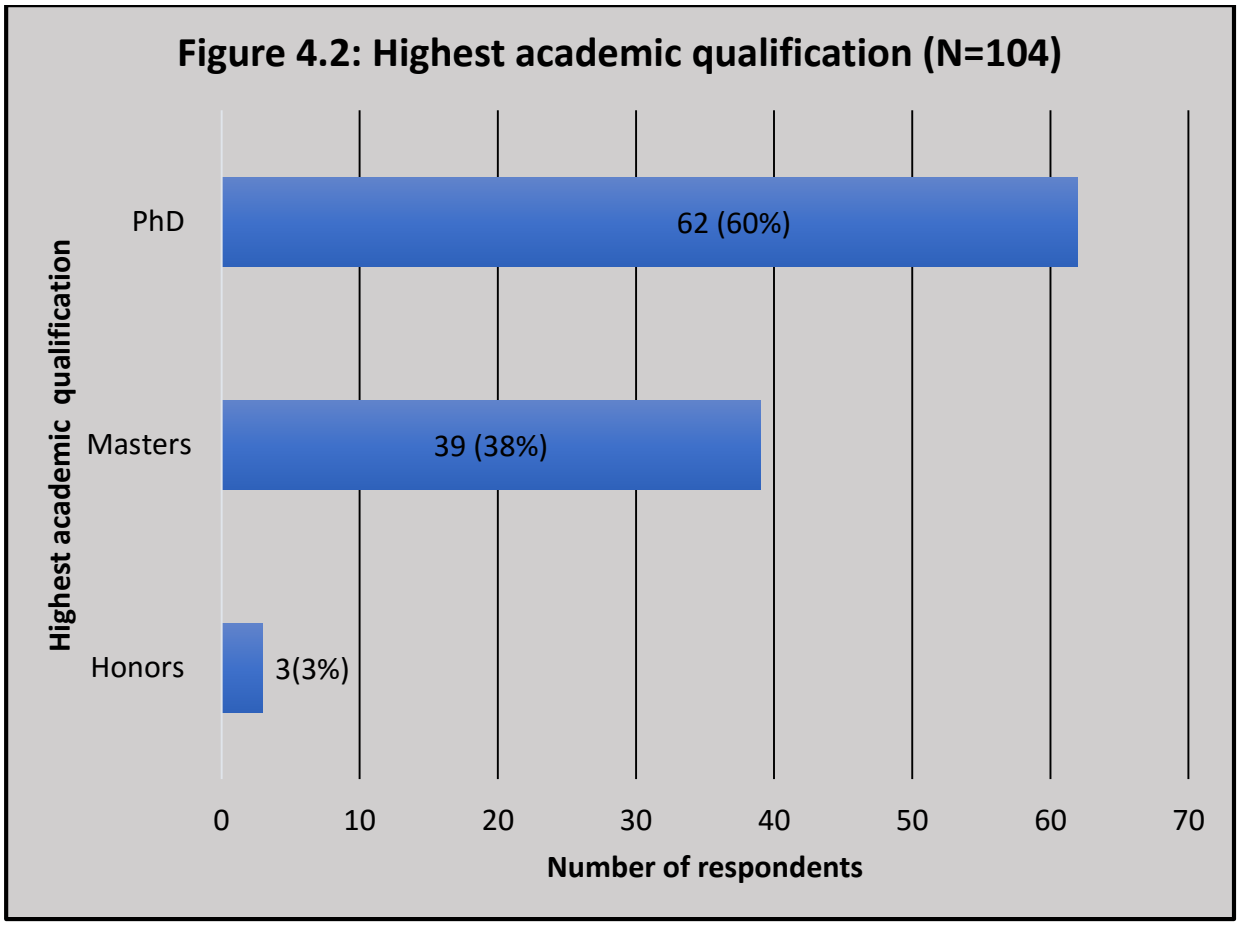
4.2.1.1.2 Period of employment

Respondents were also asked to indicate the number of years they have been employed in BUAN as an academic. Respondents had five options to choose from (see Appendix C). Figure 4.1 shows that the higher percentage scores were registered for the longer periods of employment, namely: 6-10 years (26 (24%)); 11-15 years (31 (29%)); more than 15 years (35 (32%)). This is a good indication of academic experience at BUAN and augurs well for input into this study.



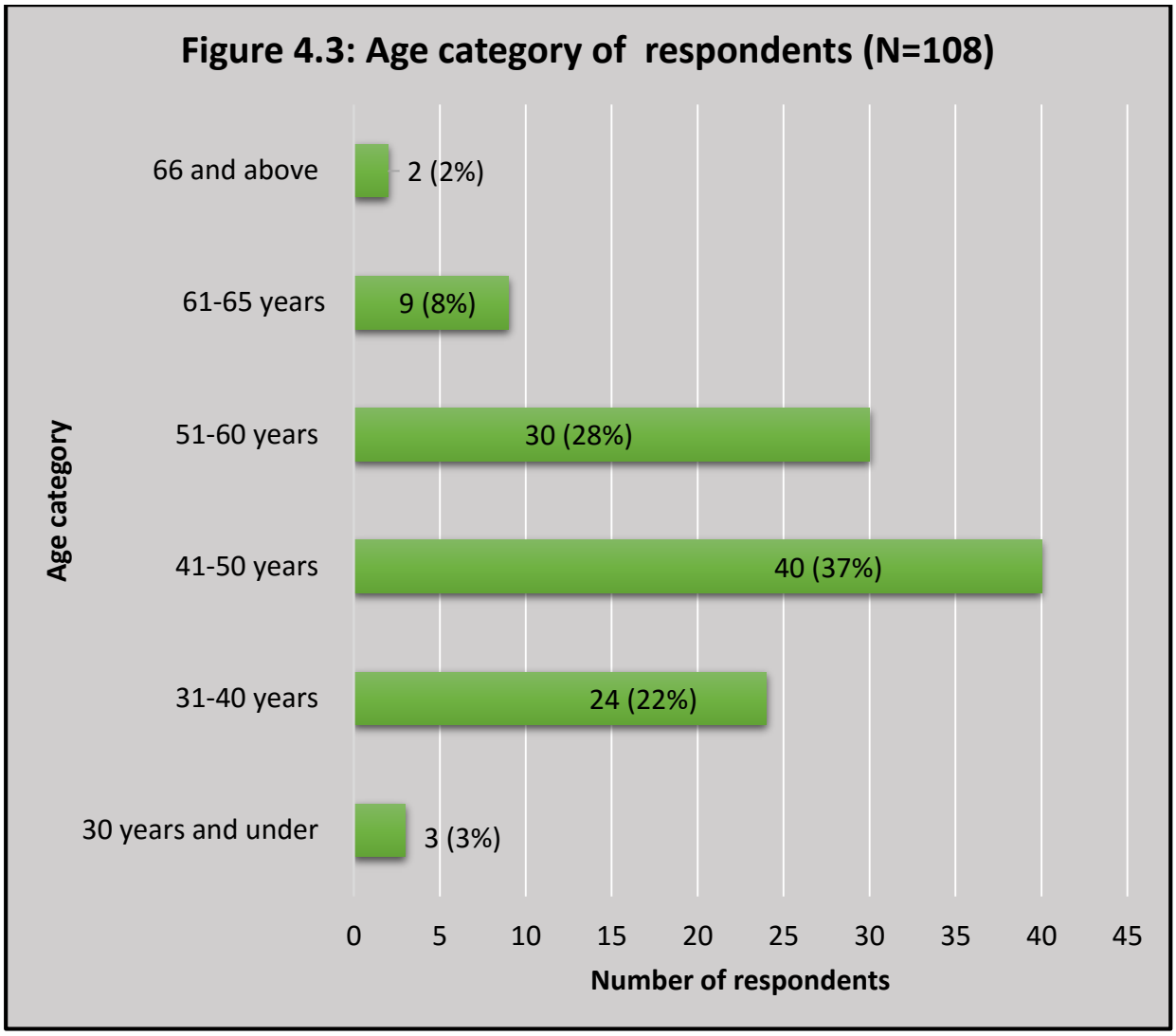
4.2.1.1.3 Highest academic qualification

In an open-ended question BUAN academics participating in the study were asked to indicate their highest academic qualifications. One hundred and four (104) out of the 108 academics responded to this item. It was good to see that PhD holders dominate with a 60% frequency count (see Figure 4.2). This has implications for potential research output for ingesting into the BUAN institutional repository (IR) by academics.



4.2.1.1.4 Age

Respondents were asked to indicate the age category they are in. The age groups were categorised as indicated in Appendix C, because different age groups respond differently to technology and embrace technological innovations such as institutional repositories differently. As evident in Figure 4.3, age category 41-50 years dominated with 37% and the next highest is age category 51-60 years with 28% - middle aged and older age groups which do not generally embrace new technology all that readily are prevalent. This has significance to the study.



4.2.1.1.5 Academic rank

BUAN has a population of 201 academics and of this 20 are professors (Botswana University of Agriculture and Natural Resources internal directory, 2017). Of the 20 professors (full and associate professors) 15 responded to the questionnaire (see Table 4.2) which means 75% of BUAN professors have participated in the study. This is significant as this is the category of academic staff who are active in research publication and therefore are potential depositors for the BUAN IR. The majority (41%) of respondents were Lecturers which is expected as this is reflective of the academic staff demographics of BUAN, that is, the majority of academics are at Lecturer level (Botswana University of Agriculture and Natural Resources internal directory,

2017). Not surprisingly there were only few Technicians who participated as their core function is not teaching, research and publication. Only 2% of respondents were Research Fellows working in different research institutes associated with BUAN. While research active, Research Fellows are few (in a small and emerging university) and were difficult to locate hence - the low response rate from this responded group. All 108 respondents responded to this item. Table 4.2 reflects the academic rank of respondents in the study.

Table 4.2: Academic rank of respondents (N=108)

Academic rank	Number of respondents	Percentage distribution
Professor	7	6%
Associate Professor	8	7%
Research Fellow	2	2%
Senior Lecturer	22	20%
Lecturer	44	41%
Junior Lecturer	14	13%
Chief Technician	4	4%
Senior Technician	5	5%
Technician	2	2%
Other (please specify)	0	0
Total	**108**	**100%**

4.2.1.1.6 Publications

Respondents were also asked to indicate the number of publications they produced. It was important to ask such a question because the study is about the institutional repository, and hence it is significant to assess if indeed there is content to be deposited into the repository. Only 59 out of the 108 participating academics responded to this item. Perhaps many of the more junior academics, who make up a sizable percentage of the 108 (see Table 4.2), are not yet publication active and for this reason did not respond to this question. Closer scrutiny of the questionnaires revealed that most of the content, not surprisingly, is generated by professors and associate professors, followed by senior lecturers and lecturers. Fifty-six percent (56%) of the publications produced is journal articles, followed by conference papers (33%) and project reports (6%). The respondents also specified other publications that they published other than the ones listed (see Appendix C) - these included newsletter articles, consultancy documents,

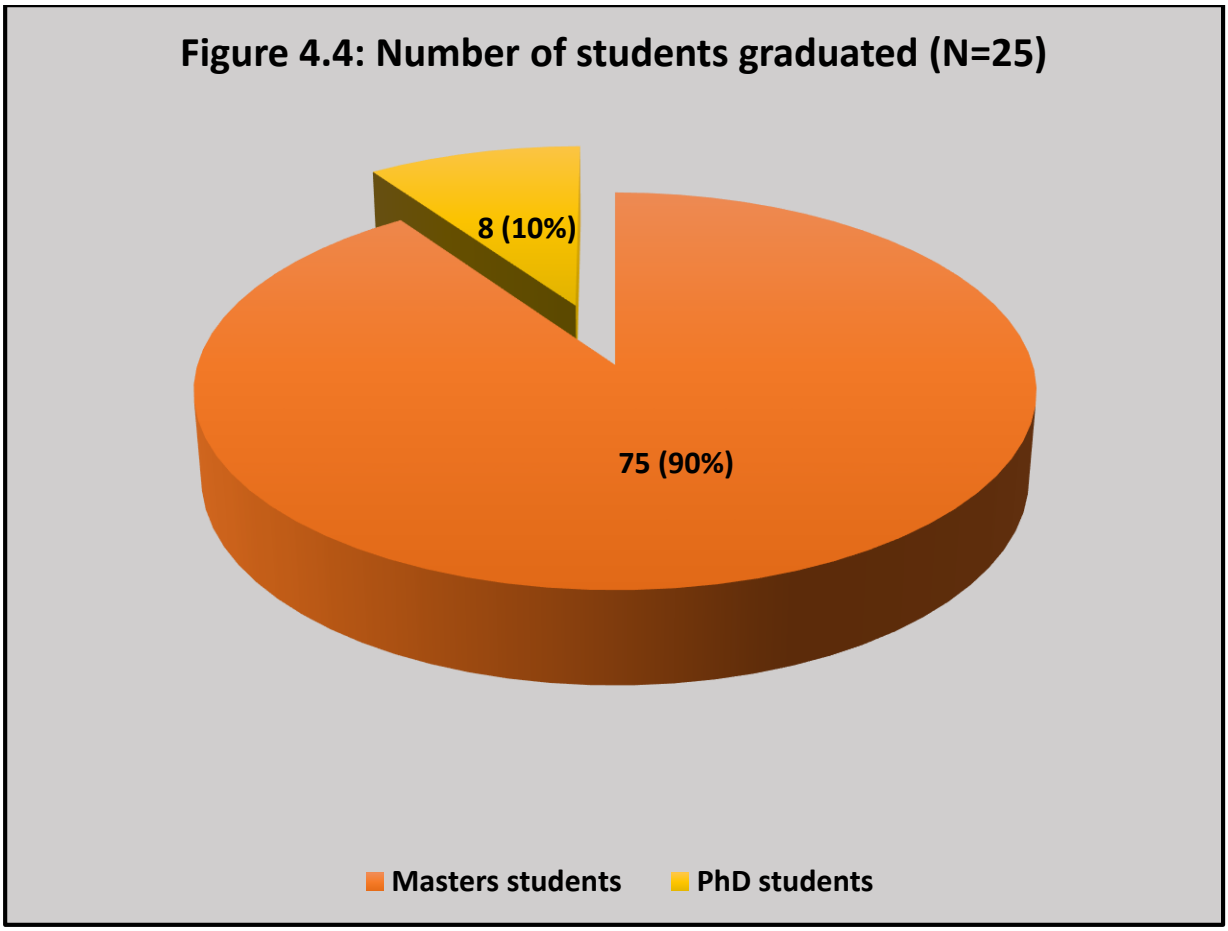
government documents, tutorials and other ephemera making up a small percentage of 2% the total number of publications produced (see Table 4.3). The response to this item is an indication that there is significant content being produced by the BUAN academics for potential deposit into the BUAN Institutional Repository. Table 4.3 captures the percentage distribution of the publication types produced by respondents.

Table 4.3: Number of publications produced by respondents (N=59)

Type of publication	Number of publications	Percentage distribution of publication
Journal articles	1045	56%
Conference papers	618	33%
Project reports	111	6%
Book chapters	30	2%
Other	31	2%
Books	25	1%
Edited volumes	14	0.7
Total	**1874**	**100.%**

4.2.1.1.7 Masters and PhD students graduated

Academics were also asked to indicate the number of Masters and PhD students they have graduated at BUAN. The question was important to ask because Masters and PhD theses and dissertations constitute content that is deposited into the institutional repository. The findings show that most graduated students are Masters students at 90% of the total 83 students graduated and PhD graduates at 10% (see Figure 4.4). When analsying the questionnaire responses to this item the researcher observed that these students were mostly graduated by professors from different departments within the BUAN. Only 25 (23%) from the 108 respondents responded to this item - a reflection of the dominance of professorial staff in the graduation of research students and that the more junior academic staff have yet to achieve this output in their academic careers.



4.2.1.2 BUAN library repository staff biographical information

The interviewed library repository staff were asked to indicate their current job designations, the period of time for which they have been employed in that position, their roles regarding the BUAN Institutional Repository and their highest LIS and/other qualifications (see Appendix D). The three library repository staff were purposively sampled because of their association with the BUAN Institutional Repository. Table 4.4 captures their profiles.

Table 4.4: Biographical information of library repository staff (N=3)

Library respondent	Job designation	Number of years in the position	IR role	Highest LIS and/other qualification
1	Senior Assistant Librarian	8 years	Repository Manager	Bachelor of Information Systems (Management)
2	Assistant Librarian	3 years	Handles the technical aspect of the repository	Bachelor of Information Systems (Management)
3	Assistant Librarian	4 years	Handles the technical aspect of the repository	Bachelor of Computer Science

4.2.1.3 BUAN information technology (IT) staff biographical information

The interviewed information technology (IT) staff were asked to indicate their current job designations, their roles regarding the BUAN IR, the period of time for which they have been performing in these roles and their highest IT qualifications (see Appendix E). The two interviewed IT staff were purposively sampled because of their roles regarding the BUAN Institutional Repository. Table 4.5 captures the biographical information of IT staff participating in the study.

Table 4.5: Biographical information of IT staff (N=2)

IT respondent	Job designation	Number of years in the position	Association with the IR	Highest IT related qualification
1	IT Manager	6 years	Technical assistance; Decision making	Bachelor of Computer Science
2	IT Officer	3 years	Handles the technology aspect of library operations including the IR	Diploma in Computer Science

4.2.2 Knowledge, skills and personal attributes required in the planning and establishing of a successful institutional repository in an academic institution

This critical question attempted to address the area of knowledge, skills and personal attributes that are required in the planning and establishing of an institutional repository in an academic institution. The empirical data addressing this critical question were derived from semi-structured interviews conducted with purposively sampled library repository staff (see Appendix D). The other source of data addressing this critical question was the literature (see Table 3.2 in Chapter 3 on mapping of critical questions to sources of data). Literature was reviewed in relation to the innovation-decision process of the Diffusion of Innovation theory as reflected in Section 2.3.3 in Chapter 2**.** This section also highlights key secondary data sourced from the literature review in response to this critical question.

Purposively sampled library repository staff were asked what knowledge (that is, what one should know or understand) is required in planning and establishing institutional repositories in academic institutions in general. They were also asked to outline what skills (that is, what one can do) are required in planning and establishing institutional repositories in an academic institution. And lastly, they were asked what personal attributes (that is, attitudes, values and personal traits) are required in planning and establishing institutional repositories in an academic institution (see Appendix D). These librarians were asked to respond to these questions because of their experience working with the institutional repository at BUAN. Table 4.6 captures their responses.

Table 4.6: Librarian views on knowledge, skills and personal attributes required in the planning and establishing of an institutional repository in an academic institution

Knowledge	Skills	Personal attributes
• Knowledge of information technology applications related to IR • Knowledge of cataloguing and classification schemes • Knowledge of metadata and different metadata standards e.g. Dublin Core • Knowledge of IR policy formulation • Knowledge of the software - being used for IR e.g. D-space • Knowledge of Referencing and citation styles as well as reference management tools e.g. Mendeley, Refworks, etc.	• Information searching skills e.g. searching across databases and funder websites for information • Ability to use different cataloguing and classification standards to catalogue and classify materials • Ability to work with different metadata standards e.g. Dublin Core metadata standard • Computing skills e.g. software installation, ability to customise software, programming skills and systems administration skills • Skills on how to navigate software used for repository e.g. D-Space software • Interpersonal skills (the ability to communicate or interact well with other people working with the IR) • Management skills (that is, planning, organising, motivating, controlling all functions of the repository) • Marketing skills (that is, ability 'sell' the repository to stakeholder such as academics)	• Staff working with the repository should be self-motivated • Positive attitude towards the work of the repository • Patience because it takes time to plan and establish an IR • Team work (that is, be able to work co-operatively with others)

Library repository staff were also asked who are other relevant stakeholders in the planning and establishing of the BUAN Institutional Repository (see Appendix D), as an institutional repository workflow involves different stakeholders from the stage of policy formulation, to metadata handling, to depositing and, finally, end-users' usage. Respondents mentioned the following stakeholders as key in the planning and establishing of the institutional repository at BUAN:

BUAN academics, Botswana Libraries Consortium, BUAN Library Committee, BUAN Library Advisory Board, BUAN Senate, IT staff and graduate student representatives. Interviewed librarians were also probed about what knowledge, skills and personal attributes should these stakeholders have for planning and establishing the BUAN Institutional Repository. Table 4.7 captures the knowledge, skills and personal attributes which librarian respondents believe these stakeholders should possess.

Table 4.7: Library repository staff views on knowledge, skills and personal attributes that IR stakeholders should possess

Knowledge	Skills	Personal attributes
• Understanding of open access and the role of institutional repositories in the open access movement • Understanding that there is no financial gain in depositing into the IR • Knowledge and understanding of the benefits of the IR • Understanding of policies which govern the IR • Knowledge and understanding of intellectual property issues	• They should have good communication skills • Computer skills because of the need to ingest content into the IR • Information searching skills (that is, ability to search different databases)	• They should appreciate the value of the IR • They should have a positive attitude towards the IR • Team work (that is, work with other parties involved in the IR workflow)

As mentioned earlier, the literature was also a source of data for the critical question relating to the knowledge, skills and personal attributes required in the planning and establishing of an institutional repository in an academic institution. The reviewed literature shows that considerable research has been undertaken to identify the knowledge, skills and personal competencies needed for effective planning and establishing of institutional repositories (Robinson 2008; Creaser et al. 2010; Nonthacumjane, 2011; Tanloet & Tuamsuk, 2011; Raju, 2014 Calarco, Shearer & Tate, 2016; Harvey & Oliver, 2016). This core competencies are important in

the 21st academic library environment, and of relevance to this study as they are significant to planning and establishing institutional repositories in academic institutions. Table 4.8 captures the knowledge, skills and personal attributes required for planning and establishing successful institutional repositories in academic institutions, that have been gleaned from the literature reviewed for this study.

Table: 4.8: Knowledge, skills and personal attributes required for planning and establishing successful institutional repositories, as reflected in the literature

Authors	Knowledge	Skills	Personal attributes
Robinson (2008)	• Management, which includes ability to coordinate and manage activities of repository personnel • Familiarity with standard Web-based software systems	• Metadata skills, which includes familiarity with relevant metadata standards including (but not limited to) Dublin Core, Machine Readable Cataloguing (MARC) • Advocacy, training & support skills which include the ability to develop an advocacy programme to address the full spectrum of stakeholders	Robinson (2008) did not cover personal attributes
Nonthacumjane (2011)	• Knowledge of content management systems • Knowledge of database development & database management systems • Knowledge of digital archiving & preservation • Knowledge of metadata & metadata standards e.g. Dublin Core • Knowledge of collection development	• Effective communication skills • Critical thinking skills • Problem solving skills • Team work skills	• Adaptable • Able to deal with a range of users • Flexible • Creative • Self-motivated
Tanloet & Tuamsuk, (2011)	• Understanding types of information resources • Understanding of information systems • Knowledge of information technology innovations • Knowledge of library management systems	• Ability to manage information resources including processes and methods in provision, selection, analyses, categorisation of information resources • Marketing skills (that is, market information services and products) • Knowledge management skills (that is, ability to build, exchange, store, disseminate, and gain access to knowledge)	• Leadership (that is, set directions and goals for the team) • Positive service attitude • Moral and professional ethics • Achievement Motivation (that is

	• Knowledge and understanding of research data management principles and theories	• Conceptual thinking skills	have motivation to achieve your tasks)
Raju (2014)	• Knowledge of data management services (including collection, metadata creation and preservation for future use) • Knowledge of digitisation • Knowledge of e-resources collection development	• General managerial/supervisory skills • General computer skills and computer literacy (including social media skills) • Branding and marketing skills • Interpersonal skills • Strategic planning • Accuracy and attention to detail skills	• Enthusiasm and initiative • Leadership • Self-motivation • Fostering change
Calarco, Shearer & Tate (2016)	• Knowledge of commercial and open access publishing platforms • Knowledge of data curation and preservation practices • Knowledge of licensing issues pertaining to open access • Knowledge of open access policies and requirements • Knowledge of repository software, metadata standards, and discovery tools	• Have the skills to manage OA publishing software services • Ability to work with local IT to develop capacity and infrastructure • Ability to work with researchers on deposit of research outputs into the repository • Ability to raise awareness about OA, including practical questions such as financing and policy adherence	• Team work • Determination • Positive attitudes
Harvey and Oliver (2016)	• Knowledge of management and administration • Knowledge of preservation planning and implementation • Knowledge of open source software and open standards • Knowledge of metadata and annotations for digital objects • Knowledge of citation formats	• Analysis and documentation skills • Description, organisation and intellectual control skills • Ability to use different metadata standards • Ability to validate and authenticate migrated data • Ability to use persistent identifiers	Harvey and Oliver (2016) did not cover personal attributes

4.2.3 Do BUAN staff (academics and relevant support staff) have the knowledge, skills and personal attributes necessary for planning and establishing a successful institutional repository at BUAN?

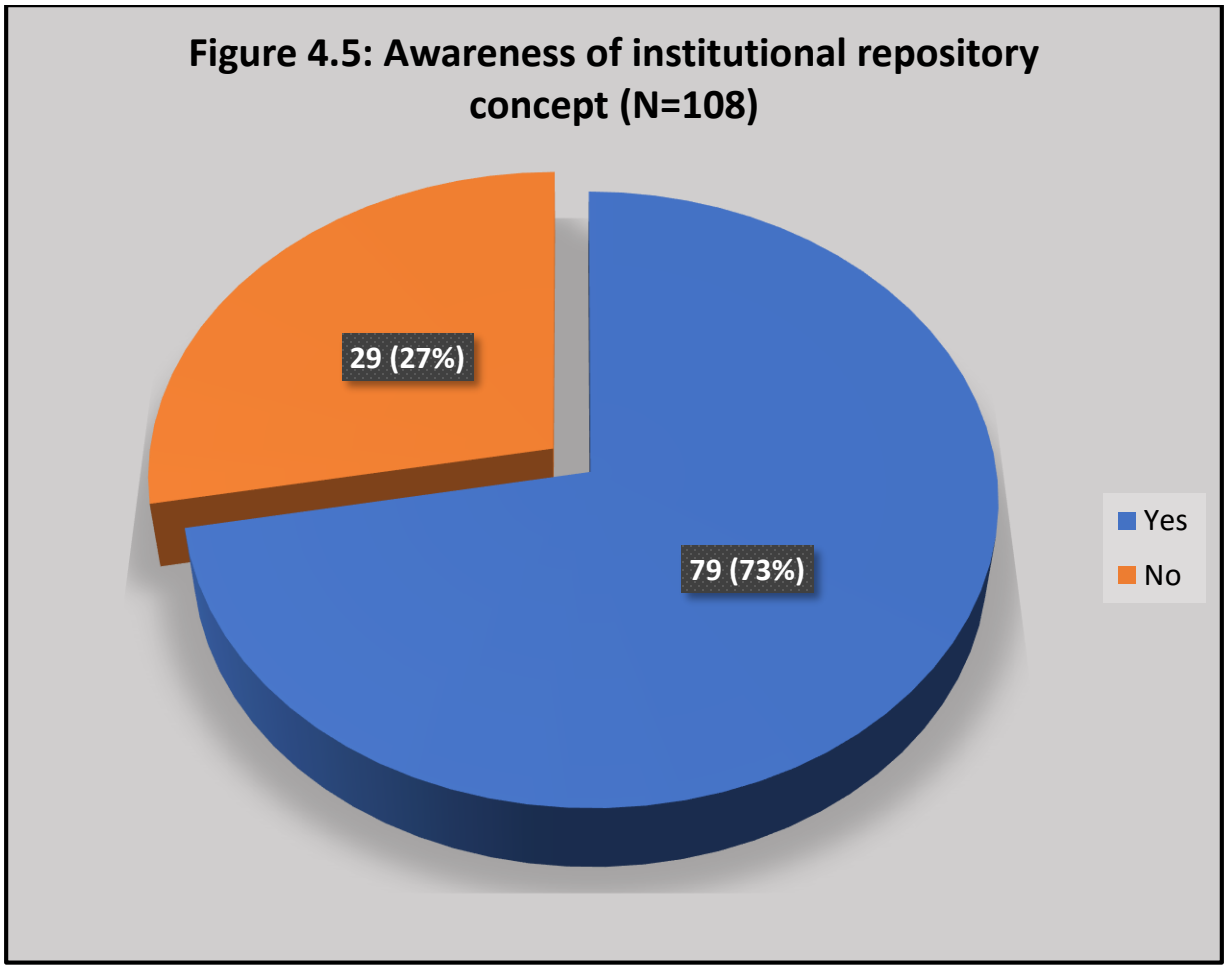
This section presents findings that address the critical question: Do BUAN staff (that is, academics and relevant support staff) have the knowledge, skills and personal attributes necessary for planning and establishing a successful repository? For triangulation purposes, the sources of data for this critical question were BUAN academics, library repository staff and selected BUAN IT staff (see Table 3.3 in Chapter 3). A structured questionnaire (see Appendix C) was administered among BUAN academics while library repository staff and IT staff associated with the IR were interviewed using a semi-structured interview schedule (see Appendices D and E). This section first presents the findings from the questionnaire followed by findings from the qualitative instruments.

4.2.3.1 Academics' responses

This section presents academics' responses on knowledge, skills and personal attributes required for the planning and establishing of a successful IR at BUAN.

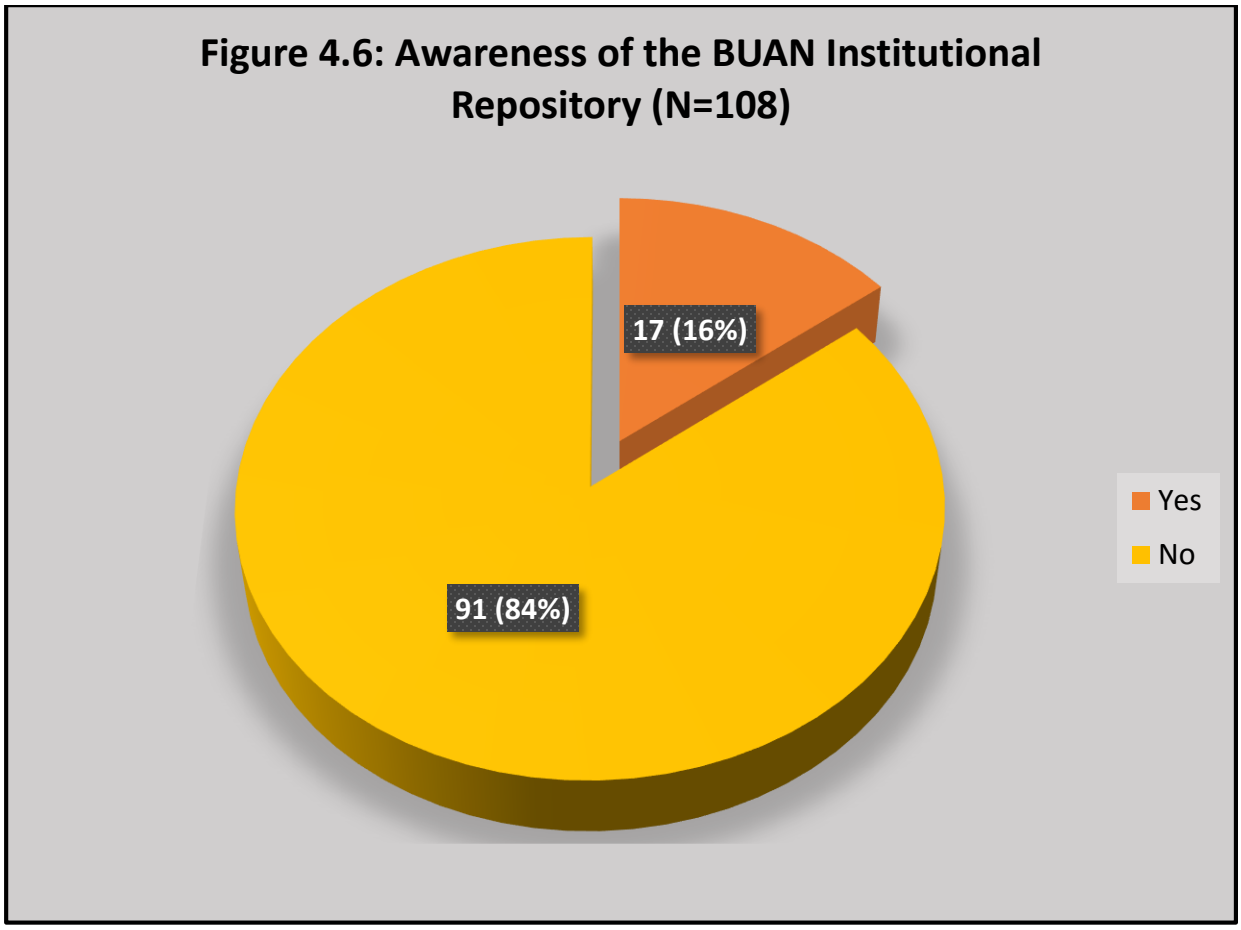
4.2.3.1.1 Awareness of institutional repository concept

Academics were asked if they are aware of the institutional repository concept in general. All 108 academics responded to this item. Figure 4.5 captures the percentage distribution of how BUAN academics responded to this item. Seventy-nine (73%) responded that they are aware of the institutional repository concept while a sizable 29 (27%) responded in the negative.



4.2.3.1.2 Awareness of BUAN Institutional Repository

As Rogers (1983: 164) indicated, to diffuse an innovation to people, knowledge is the first step to start with. Item 9 in Appendix C sought to find out if academics are aware of the BUAN Institutional Repository. Only 17 (16%) of the 108 respondents indicated that they are aware of BUAN Institutional Repository while a worryingly large majority of 91 (84%) pointed out that they are not aware of the BUAN Institutional Repository. Figure 4.6 captures how academics responded to this item.



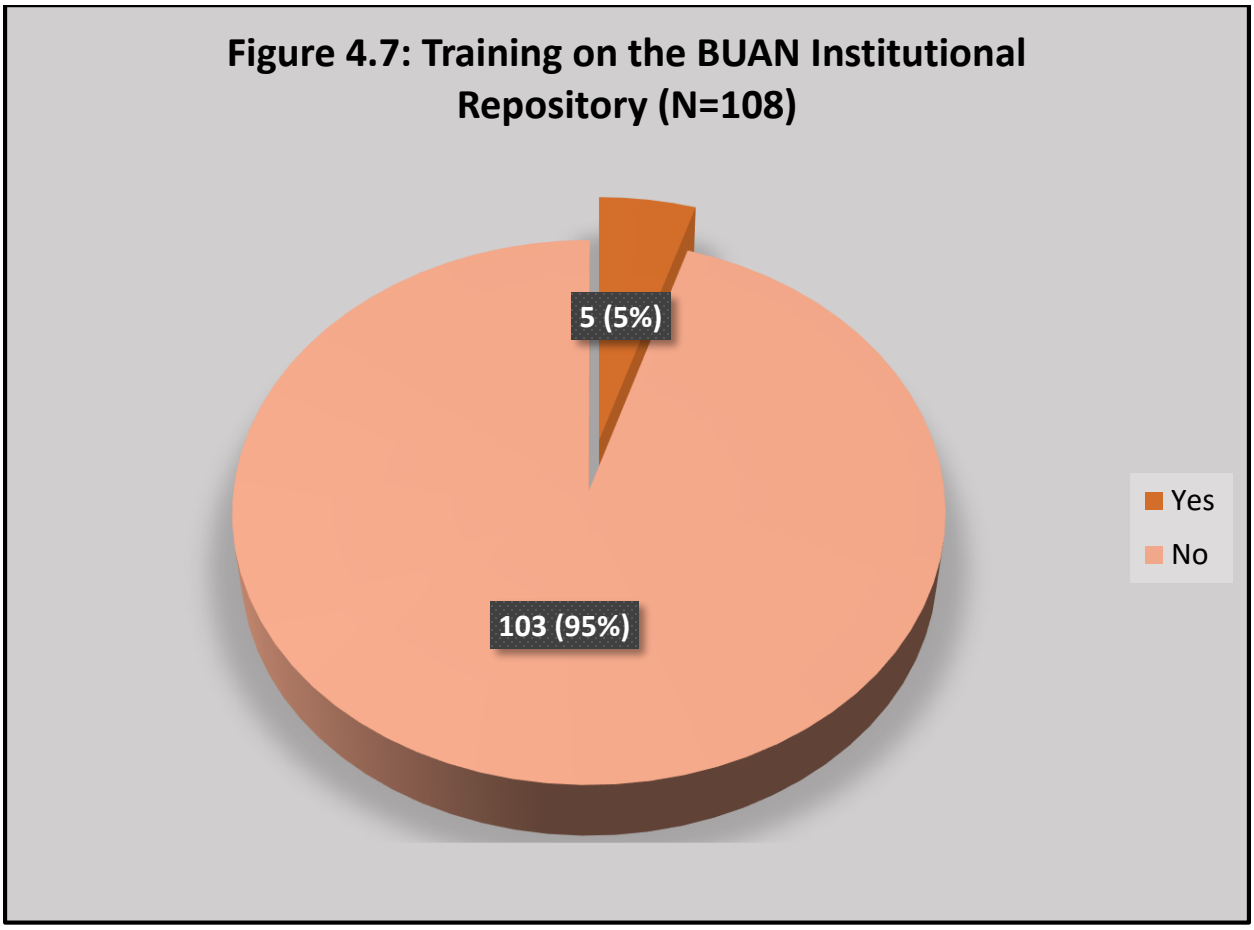
Those BUAN academics who acknowledged that they are aware of BUAN Institutional Repository were also asked to indicate how they came to know about BUAN's institutional repository. The responses from these 17 respondents are presented in Table 4.9.

Table 4.9: How BUAN academics came to know about the IR (N=17)

How did you come to about the BUAN IR?	Frequency
From Library staff, through one-on-one discussion during Library Week	5
Through email from the Library	4
It is compulsory for BUAN students to deposit their dissertations with the library	2
Via an information leaflet from the Library	1
A librarian introduced the IR at a Library Committee meeting on library developments	1
By browsing the Library website	1
Through a performance service management (PMS) discussion meeting held with the PMS coordinator	1
From colleagues during personal chats	2
Total	**17**

4.2.3.1.3 Training on the BUAN Institutional Repository

Academics were asked whether they have received any training on the BUAN Institutional Repository. An overwhelming majority of respondents, 103 (95%) out of the 108 academics, indicated that they have not received any training on the BUAN IR. This is not surprising considering that 84% of the 108 academics indicated that they are not aware of the BUAN Institutional Repository (see Figure 4.6). A paltry 5% of the respondents indicated that they have received some training on the BUAN IR (see Figure 4.7).



BUAN academics who indicated that they have received some training on the IR (five in total - see Figure 4.7), were asked to select from three options (see Item 12 of Appendix C) on who provided the training. They indicated that the training was provided by BUAN Library repository staff, which was one of the three options provided. These five respondents were further probed about the form in which the training was provided (see Appendix C). All five indicated that the training was provided in the form of one-on-one training. They were also asked what the training was about (see Item 14 of Appendix C) and of the options provided these respondents selected the following: Repository awareness training (that is, the role of BUAN's Institutional Repository in promoting visibility and discoverability of the research output of the institution) and Intellectual property issues (e.g. copyright, creative commons licensing, embargos).

4.2.3.1.4 Knowledge required to contribute to a successful institutional repository at BUAN

Respondents were asked if they believe they have the knowledge itemised (see Item 15 of Appendix C) to contribute to a successful institutional repository at BUAN. They could select more than one option and hence totals do not need to add up to 100%. Only 68 (63%) out of the 108 academics responded to this item. The considerable number of academics (40 or 37%) who did not respond to the question is in keeping with the general trend in the findings of many academics not being aware of or familiar with the BUAN IR – hence their reluctance to engage with this item in the questionnaire. Table 4.10 captures responses of those who engaged with this item. Knowledge of intellectual property issues (72%) and open access (62%) seem to have received relatively high frequency counts. None of the respondents selected the 'Other' option.

Table 4.10: Knowledge required by academics to contribute to a successful BUAN IR (N=68)

Knowledge	Number of respondents	Percentage distribution
Knowledge of intellectual property issues	49	72%
Understanding of the concept of open access (that is, free and full access to research output)	42	62%
Understanding funder policies/mandates on open access publishing of research output	30	44%
Awareness of the role of BUAN's Institutional Repository in promoting visibility and discoverability of the research output of the institution	10	15%

4.2.3.1.5 Skills required to contribute to a successful institutional repository at BUAN

Respondents were asked if they believe they have the skills itemised (see Item 16 of Appendix C) to contribute to a successful institutional repository at BUAN. Respondents could select more than one option and hence totals do not need to add up to 100%. Here again only 74 (69%) of the 108 academics responded to this item and a sizable number of 34 (31%) left this item unanswered. Table 4.11 shows that here too (as in Table 4.10 about knowledge required) a high

percentage (74%) of BUAN academics claimed to have skills relating to negotiating copyright issues. Not surprisingly ingesting and updating content registered very low percentages of 7% each as respondents have already shown that they, in large part, have not received any training on the BUAN IR. Interestingly 4 (6%) respondents indicated under the 'Other' option that they have "no skills'' and hence their reluctance to engage with this item.

Table 4.11: Academics' skills required to contribute to a successful repository (N=74)

Skills	Number of respondents	Percentage distribution
Negotiating copyright issues with publishers	55	74%
Searching for copyright policies in databases such as *Sherpa-Romeo* or journal homepages	30	41%
Creating a username and password to access BUAN's Institutional Repository	15	20 %
Searching and discovering relevant content from the institutional repository	15	20%
Ingesting/depositing of content (e.g. journal articles, conference papers, conference proceedings, theses & dissertations) into the repository	5	7%
Updating submissions to the repository (e.g. replacing pre-print articles and work-in-progress with final published versions)	5	7%
Other	4	6%

4.2.3.1.6 Personal attributes required to contribute to a successful institutional repository at BUAN

Academics were also asked if they believe they have personal attributes itemised (see Item 17 of Appendix C) to contribute to a successful institutional repository at BUAN. Respondents could select more than one option. Due to the generic nature of the options, it is not surprising that many academics (102 or 94%) responded to this item and most items notched up reasonably

good frequency and percentage scores. Table 4.12 captures how they responded. None of the respondents selected the "Other" option.

Table 4.12: Relevant personal attributes required by academics to contribute to a successful IR at BUAN (N=102)

Relevant personal attributes	Number of respondents	Percentage distribution
As an academic I should make the time to deposit and update submissions to BUAN's Institutional Repository	77	76%
I should make myself available for necessary repository training for academics and researchers	76	75%
I value the long-term preservation of research output that BUAN's Institutional Repository offers	72	71%
I feel strongly about the visibility and discoverability of BUAN's research output	70	69%
I promote the use (depositing and searching) of BUAN's Institutional Repository among my academic colleagues and postgraduate students	62	61%
I have a social responsibility to openly share my research output (social justice obligation)	59	58%

4.2.3.2 Library repository staff responses

The three interviewed library repository staff were asked if they believe they have the knowledge, skills and personal attributes required for planning and establishing a successful institutional repository at BUAN. The interviewed librarians seem to be confident that they are knowledgeable enough to contribute to a successful BUAN IR. They answered positively indicating that they have knowledge sets they alluded to in Table 4.6. One crucial factor they mentioned regarding the planning and establishing of the IR at BUAN is that they need support and motivation from Senior Library Management and other relevant stakeholders. For example, since technology is constantly changing, interviewed librarians pointed out that continuous training is important to keep abreast with current trends in this area.

The librarians were probed about whether they have the skills that they mentioned (see Table 4.6) that are required for planning and establishing an IR in an academic institution. Again, the

interviewed librarians confidently indicated that they have the skills to contribute to a successful IR at BUAN. But again, they emphasised that continuous training is essential in order to refresh skills and acquire new skills in order to stay abreast of latest IR developments.

Interviewed library staff were also asked if they believe they have the relevant personal attributes to contribute to a successful institutional repository at BUAN. All three interviewees demonstrated positive attitudes and perceptions towards the IR as they asserted that they want to see the BUAN IR running on the World Wide Web. Further, they showed in their physical manner and demeanour that they were thrilled to be interviewed on issues regarding the BUAN IR.

4.2.3.3 IT staff responses

The BUAN IT staff interviewed were asked if they believe that the IT staff working with BUAN's IR have the required knowledge, skills and personal attributes for planning and establishing a successful institutional repository at BUAN (see Appendix E).

While the IT staff interviewed admitted that they know of the existence of the BUAN IR, they somewhat distanced themselves from it indicating that all the operations of the BUAN IR are handled by the Library repository staff. They also claimed that they do not have the knowledge required for planning and establishing a successful IR at BUAN because they are not very conversant with D-Space software used for the repository. They further indicated that they have not yet had a chance to interact with the BUAN IR.

Even though they have not interacted with the BUAN IR, the IT staff interviewed expressed belief that if they are properly trained on D-Space they could develop the knowledge and skills to handle the IR effectively. Importantly, when probed on the issue of whether the BUAN IR server would be better managed located in the IT Department, the library or elsewhere (e.g. cloud-based) they indicated that the IR would be better managed by library staff (located in the library) as it is currently, because library staff understand their systems need better than IT staff, for example, the embedded metadata that comes with the system. When commenting on whether IT staff working with BUAN's IR have relevant personal attributes to contribute to the planning

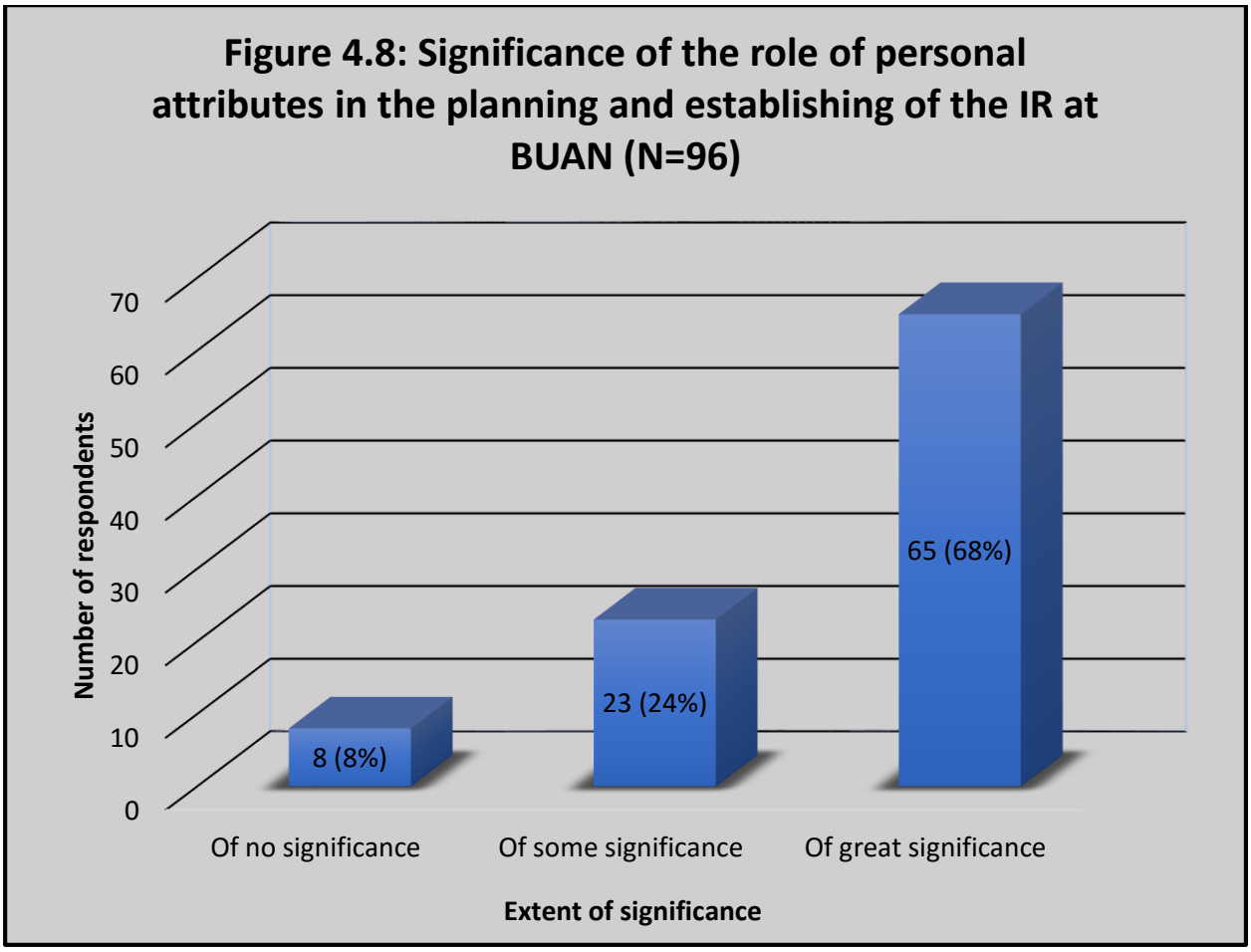
and establishing of a successful IR at BUAN, IT staff interviewed indicated that they treat all the systems of the University the same, that is, they do not have negative attitudes towards issues relating to any system within the University, including the BUAN IR.

4.2.4 The significance of the role of personal attributes such as attitudes and perceptions in the planning and establishing of an IR at BUAN

The innovation-decision process from of DoI theory by Rogers (1983: 164) shows that after an individual have acquired knowledge about an innovation he/she forms a favourable or unfavourable attitude as to whether to pursue the innovation or not. This section reports on findings which addressed the third critical question guiding the study: How significant a role does personal attributes such as attitudes and perceptions play in the planning and establishing of an IR at BUAN. The question seeks to ascertain if academics, library repository staff and IT staff (see Table 3.3 in Chapter 3) formed a favourable or unfavourable attitude about the BUAN IR upon acquiring knowledge of it as Rogers (1983: 164) has alluded to in the innovation-decision process of the DoI theory.

4.2.4.1 Academics' responses

BUAN academics were asked how significant a role they believe personal attributes such as a positive attitude towards the role and functioning of the institutional repository on the part of academics and researchers, play in the planning and establishing of the repository at BUAN (see Appendix C). Nighty-six (96 or 89%) of 108 academics responded to this item, seven left this item blank while five indicated that they were "not sure", even though this was not provided as an option (see Item 18 in Appendix C). It is evident in Figure 4.8 that the majority of BUAN academics believe that personal attributes play a significant role in the planning and establishing of the IR at BUAN.



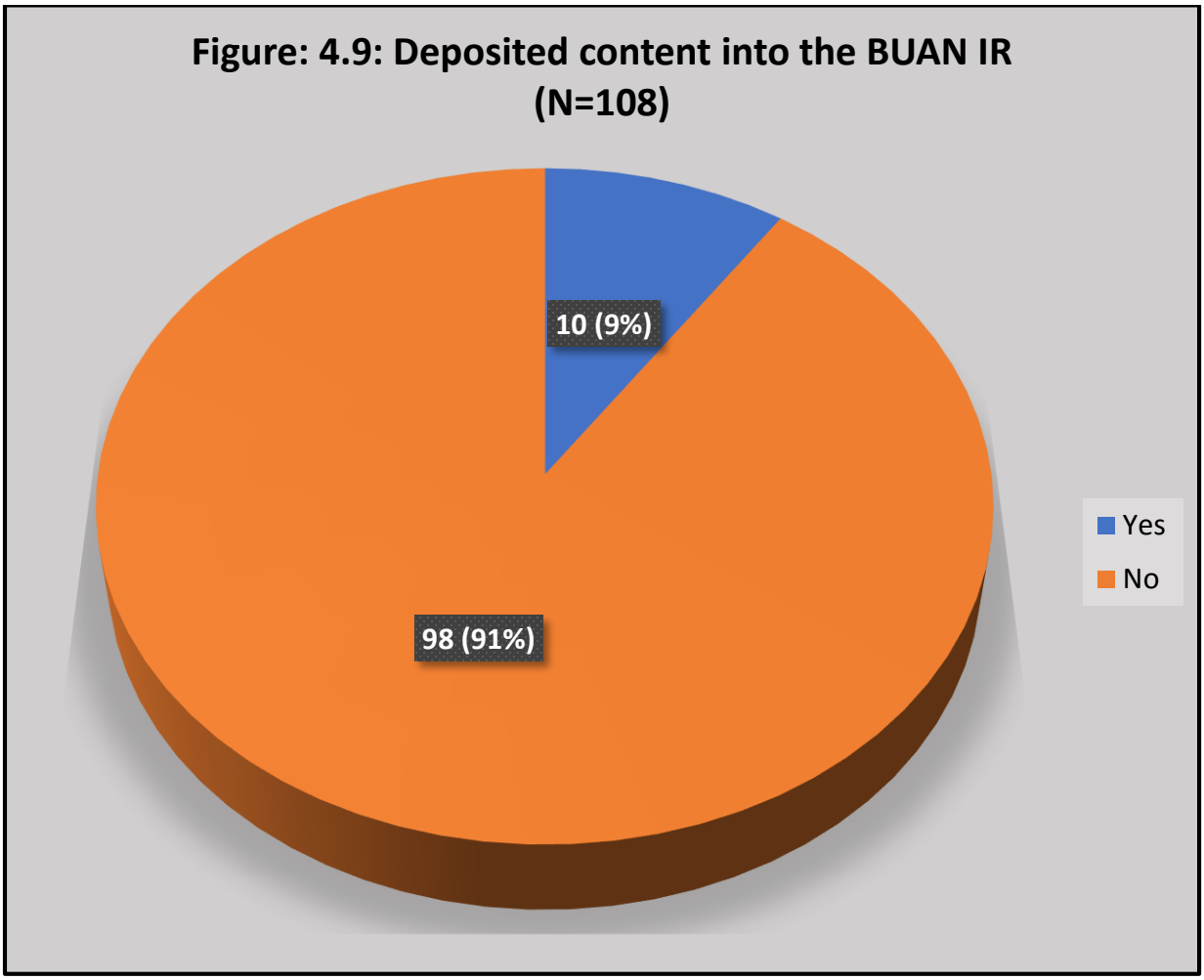
Respondents were asked to elaborate on their choice of responses reflected in Figure 4.8. The eight respondents who indicated that personal attributes have no significance and the five who stated that they were "not sure", unfortunately, did not elaborate on their responses or elaborate further in the case of those who indicated "not sure". Table 4.13 captures explanations of respondents who selected 'Of some significance' or 'Of great significance'. Not all 88 (65 plus 23) who responded in this way provided explanations, and hence Table 4.13 captures only those explanations provided.

Table 4.13: Reasons why academics believe personal attributes play a significant role in the planning and establishing of the IR at BUAN

Response	Explanation	Frequency
Of some significance	Positive attitudes will contribute to the growth of the repository, because if one has a positive attitude one will be eager to deposit into the repository	12
	Academics should be on board in the planning and establishing of the BUAN IR to make the project a success	5
Of great significance	If academics do not value the repository as a publishing platform, they may not be willing to contribute their research to the repository	6
	If all concerned stakeholders can work together with good attitudes and self-realisation in the planning and establishing of the BUAN IR, the project will succeed	4
	Negative attitudes result in minimal participation and hence attitudes have a great significance in the planning and establishing of the IR	3
	Since people must commit to the exercise they may develop some negative attitude towards BUAN IR for, example, they might feel depositing will be an extra burden on their daily academic tasks	3
	If research is funded using public funds, the results should be made available openly through platforms like the BUAN IR and hence this denotes a positive attitude	3
	People are always afraid of change and to adopt innovative technologies which can be a contributing factor to slow adoption of the BUAN IR by academics	2

BUAN academics were asked whether they have ever deposited content into the BUAN's Institutional Repository. The innovations-decision process from the DoI theory (Rogers, 1983: 164) indicates that once individuals have been persuaded by an innovation they will implement it. This question (Item 19 in Appendix C) sought to find out if BUAN academics are implementing use of the IR by deposing content into it. All 108 academics responded to this item. Of concern is that a very large majority of 91% of the respondents revealed that they have not deposited into the BUAN IR (see Figure 4.9). This is not surprising considering earlier responses that many

academics were not aware of the BUAN IR and that they have not been trained on how to deposit material into the IR. Only 9% indicated that they have deposited into the BUAN IR.



There was a follow up question requiring those who responded 'Yes' in Figure 4.9 (10 in total) to indicate, from a list of options provided the kind of content they have deposited (see Item 20 of Appendix C). Majority of those who responded (7 of 10) indicated that they have deposited theses/dissertations. This is not surprising as this is the most common content deposited into institutional repositories because of the institutional copyright attached to them. The remaining three indicated that they had deposited published journal articles. There was no other content

indicated from those among the itemised (see Item 20 in Appendix C). This is an indication that a lot of repository advocacy work is required at BUAN.

Respondents who answered 'Yes' in Figure 4.9 (10 in total) were also asked to indicate what motivated them to ingest/deposit in the BUAN IR. Table 4.14 captures their responses. Respondents could select more than one option.

Table 4.14: Motivation to ingest/deposit into BUAN's IR (N=10)

Motivation for ingesting/depositing	Number of respondents	Percentage distribution
To increase visibility and discoverability of my research	1	10%
Potential for greater impact of my work in the research community	2	20%
I feel obliged to ingest/deposit my research output into this University facility	7	70%
For long term preservation of my scholarly output	4	40%
Other (please specify) Supervisors instructed students to deposit a copy of their theses/dissertations at the library as this is a University requirement	6	60%

Those academics who responded 'No' in Figure 4.9 (98 in total) were asked to select from a list of options provided (see Item 22 in Appendix C), reasons for not ingesting/depositing into the BUAN's IR. All 98 academics who answered 'No' in Figure 4.9 responded to this item. Table 4.15 captures their responses. Respondents could choose more than one option. While many reasons were provided by academics for not ingesting, the 86% notched for lack of knowledge and skills on how to ingest/deposit content into the BUAN IR, is significant and consistent with earlier responses relating to lack of training on how to deposit material into the IR.

Table: 4.15 Reasons for not ingesting in the BUAN IR (N=98)

Reason	Number of respondents	Percentage distribution
I have lack of knowledge and skills on how to ingest/deposit my content into the BUAN Institutional Repository	84	86%
Fear of misuse of my work (e.g. plagiarism)	40	41%
Fear of copyright infringement on my part	33	34%
To date I have had no research output to ingest/deposit	30	31%
There is no peer review process in repository 'publishing'	30	31%
My view is that institutional repositories have low prestige among publishing platforms	27	28%
Ingesting/depositing into the repository is a further administrative burden for academics	24	24%
I already have a platform where I archive my research output (e.g. my personal website)	9	9%
Other (please specify)	0	0%

4.2.4.2 Library repository staff responses

Interviewed library repository staff were also probed on the issue of whether they believe that personal attributes such as a positive attitude towards the role and functioning of the institutional repository on the part of academics and researchers, play a significant role in the planning and establishing of the repository at BUAN. Like the academics surveyed, interviewed librarians too emphasised that every stakeholder who is part of the IR should be on board; "positive attitude will give positive results working with the repository", remarked one librarian. Another explained that if academics do not fully participate as sole depositors, the repository will never succeed. As with the innovation-decision process Rogers (1983: 164) where persuasion occurs when an individual engages in activities that lead to a choice to adopt or reject an innovation, interviewed librarians too pointed out that among those who were persuaded by the BUAN IR innovation were academics who have formed positive attitudes towards the repository and they are willing to deposit once the IR is fully functional. Librarians interviewed also indicated

that the majority of academics have not yet understood and bought into the idea of the institutional repository.

4.2.4.3 IT staff responses

Interviewed IT staff were not probed on the issue of the role personal attributes on the part of academics, play in the planning and establishing of the IR at BUAN because of their pre-occupation (by virtue of their job roles) with the technology aspects of the repository only. Instead IT staff were asked if they believe the BUAN's Institutional Repository server is better managed with it being located in the IT department, the Library or elsewhere (e.g. cloud-based). Both interviewed IT staff responded that the BUAN IR server should be managed and located in the Library because library repository staff are the ones who have greater expertise in the repository system, compared to them (that is, BUAN IT staff). Further, they explained that to put the server on cloud depends on the system requirements and data protection policies.

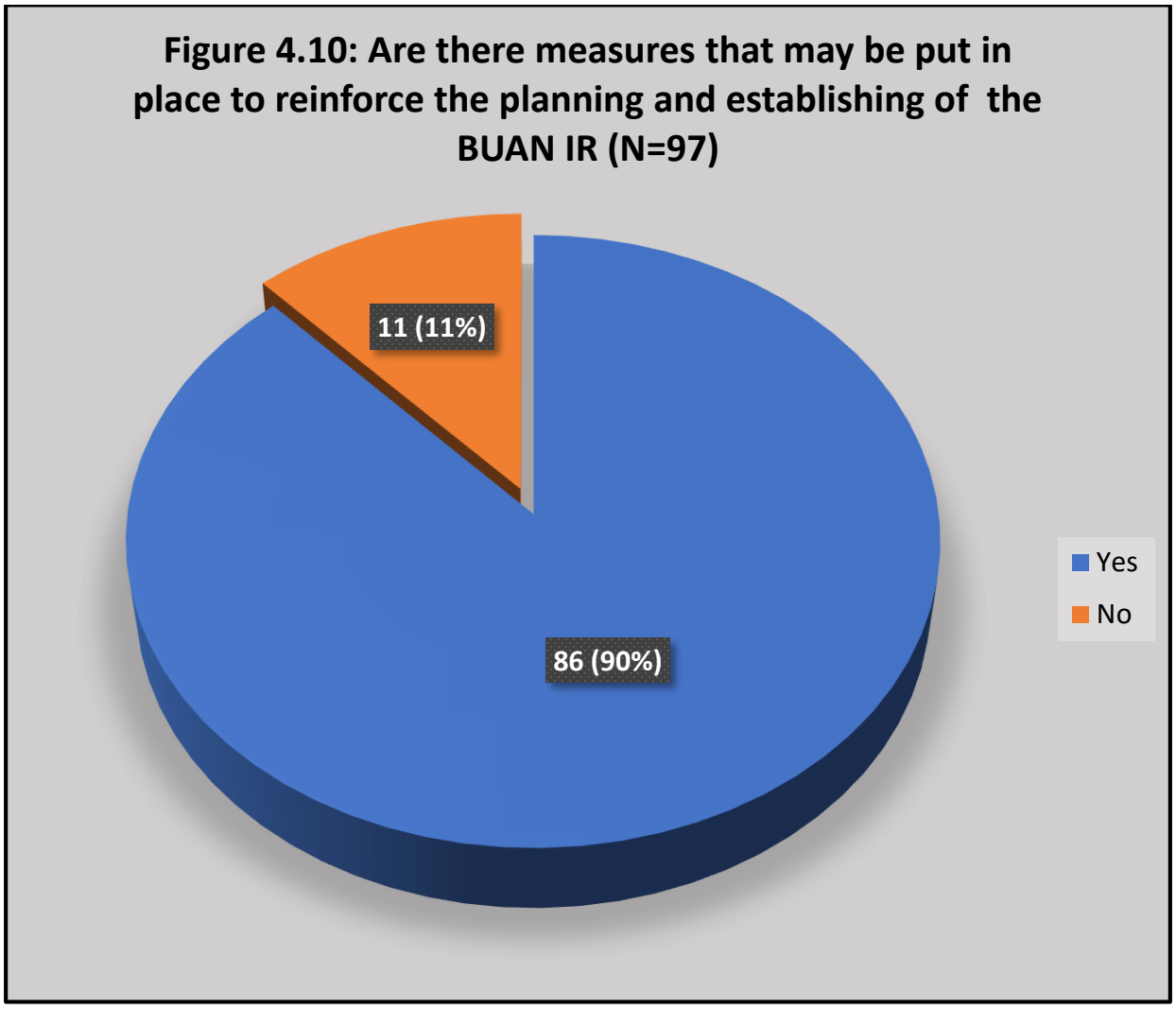
4.2.5 Measures that may be put in place to reinforce the planning and establishing of an institutional repository at the BUAN Library

This section presents findings that address the critical question: What measures may be put in place to reinforce the planning and establishing of an institutional repository at the BUAN Library. According to the DoI theory (Rogers, 1983: 164) confirmation or adoption of an innovation occurs when an individual seeks reinforcement of an innovation-decision already made. Hence this critical question addressed the issue of whether BUAN academics, library repository staff and IT staff believe that there are measures that should be put in place to reinforce the planning and establishing of the BUAN IR. For triangulation purposes, the sources of data for this critical question were BUAN academics, library repository staff and IT staff (see Table 3.3 in Chapter 3).

4.2.5.1 Academics' responses

BUAN academics were asked if they believe that there are measures that may be put in place to reinforce the planning and establishing of the institutional repository at the BUAN Library.

Ninety-seven (97 or 90%) of the 108 academics responded to this item. Their responses are captured in Figure 4.10.



The respondents were asked to elaborate on their responses as reflected in Figure 4.10 and it was mostly those who responded 'Yes' in Figure 4.10 who elaborated. Table 4.16 captures elaborations provided. Not all those who answered 'Yes' elaborated their responses.

Table 4.16: Elaborations by academics on measures that may be put in place to reinforce the planning and establishing of the institutional repository at the BUAN Library

Response	Explanation	Frequency
Yes	The Library repository staff should train academic staff members and induct new staff members about the IR	12
	An IR policy governing the planning and implementation of the IR should be put in place and it should be mandatory (if possible) for academic staff to deposit into the BUAN IR.	6
	BUAN must secure some funds to expand technology infrastructure to support new technological innovations such as the IR	3
	Academic staff team leaders could enforce depositing into the IR through annual performance management reviews to encourage academics to deposit their work into BUAN IR	3
	The Library should reach out to potential users of the IR through meetings and training workshops to raise BUAN IR awareness	2
	The BUAN Library can establish library repository committees at departmental levels to encourage academic staff to deposit into BUAN IR	2
	The library repository staff should establish good inter-departmental interactions and hold workshops to train academics	1
	BUAN library repository staff should have a rigorous campaign for the BUAN's institutional repository, and assign a specific person to "take staff along" in depositing content into the BUAN IR	1
	The BUAN IR is a huge project that needs a workflow with roles and responsibilities	1

BUAN academics were also asked if they foresee challenges for the BUAN IR. Ninety-five (95 or 88%) of the 108 academics responded to this item. Figure 4.11 captures their responses to this item and the elaborations on their choice of responses are captured in Table 4.17. Not all who responded provided elaborations. Two academics of the 95 who responded indicated that they have "no clue" if the BUAN IR has challenges, and unfortunately these two did not elaborate further.

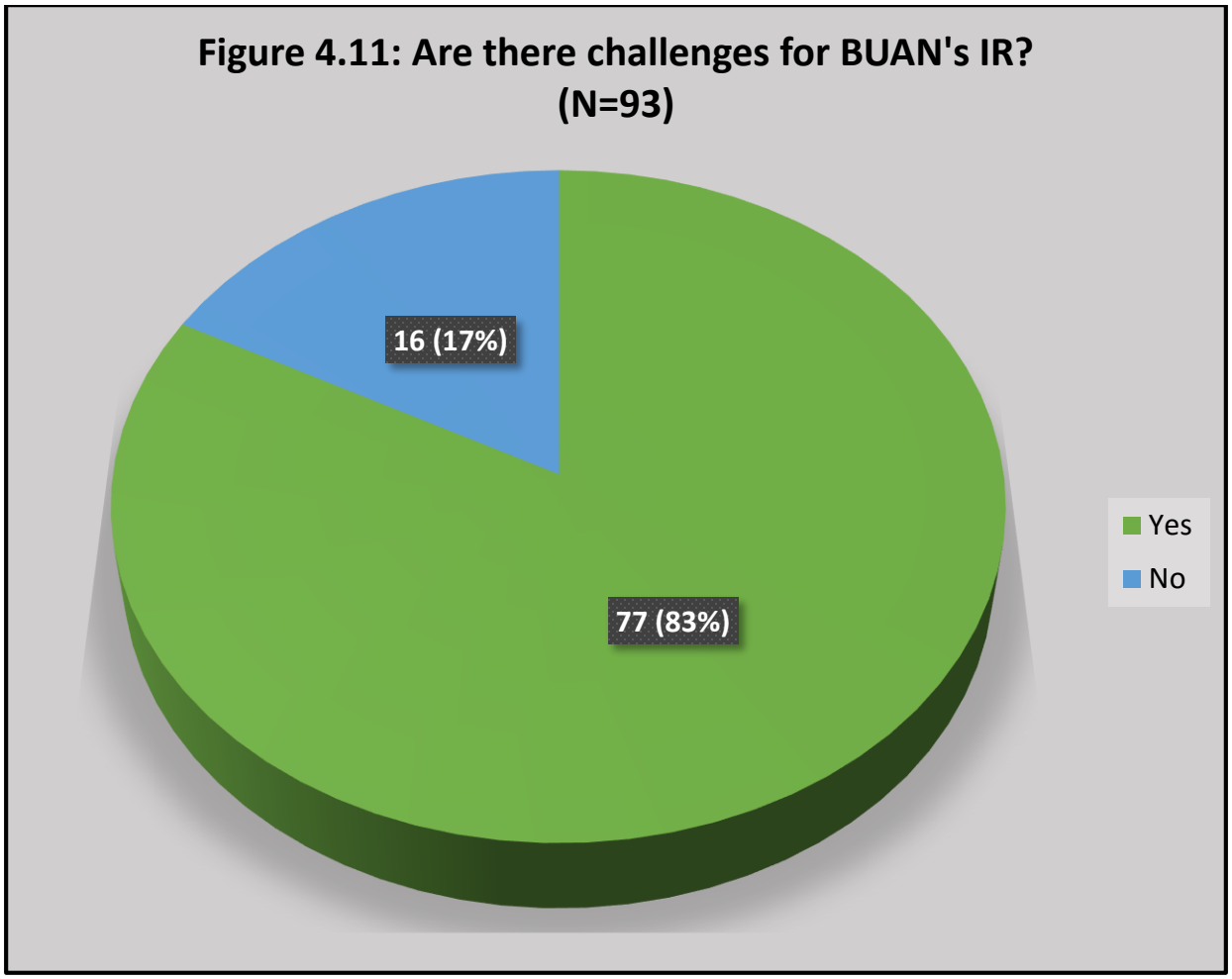


Figure 4.11: Are there challenges for BUAN's IR? (N=93)
16 (17%)
77 (83%)
Yes
No

Table: 4.17: Elaborations by academics on challenges for BUAN's IR

Response	Explanations	Frequency
Yes	There is a challenge at BUAN with Internet connectivity (the bandwidth is very low)	15
	BUAN has challenges with financial resources hence it might not be able to support the project and train staff.	10
	Infrastructure is inadequate (that is, shortage of dedicated servers for the IR, poor internet connectivity, old computers, etc.)	9
	Without a policy in place governing the IR it will not succeed	4
	There is no peer review for some information that goes into the repository and this poses quality challenges for the repository	2
	Staff who place content into the IR may be held liable for copyright infringement by other parties	1
	There seem to be no staff dedicated to managing the repository only at BUAN Library and this poses a challenge to the IR	1
	BUAN is a relatively new institution and institutional restructuring could affect projects such as the IR because people are pre-occupied with transformation and hence they have limited time to deposit	1
	Lack of dedication by staff tasked with running the IR as well as lack of support by management.	1
No	Once people have knowledge about the importance and purpose of the BUAN IR they will appreciate it and start ingesting/depositing content	2
	With the good library staff that we have, and adequate training of academics and postgraduate students, the planning and establishing of the BUAN IR should be an achievable project	1

Academics were also asked if they foresee opportunities for the BUAN IR. It was encouraging to see that most respondents responded positively to this item (see Figure 4.12). In total 104 (96%) of the 108 academics responded to this item. Of these only two indicated that they do not foresee opportunities for the BUAN IR. Unfortunately, these two academics did not elaborate on why they believed this is to be the case. Two academics chose to respond that they have "no clue" on this item. The 'Yes' elaborations are captured in Table 4.18. The researcher observed from the elaborations that this questionnaire was an eye opener for respondents about the BUAN IR and

about open access as much of the terminology used were phrases picked from Items 15, 16 and 17 of the questionnaire (see Appendix C).

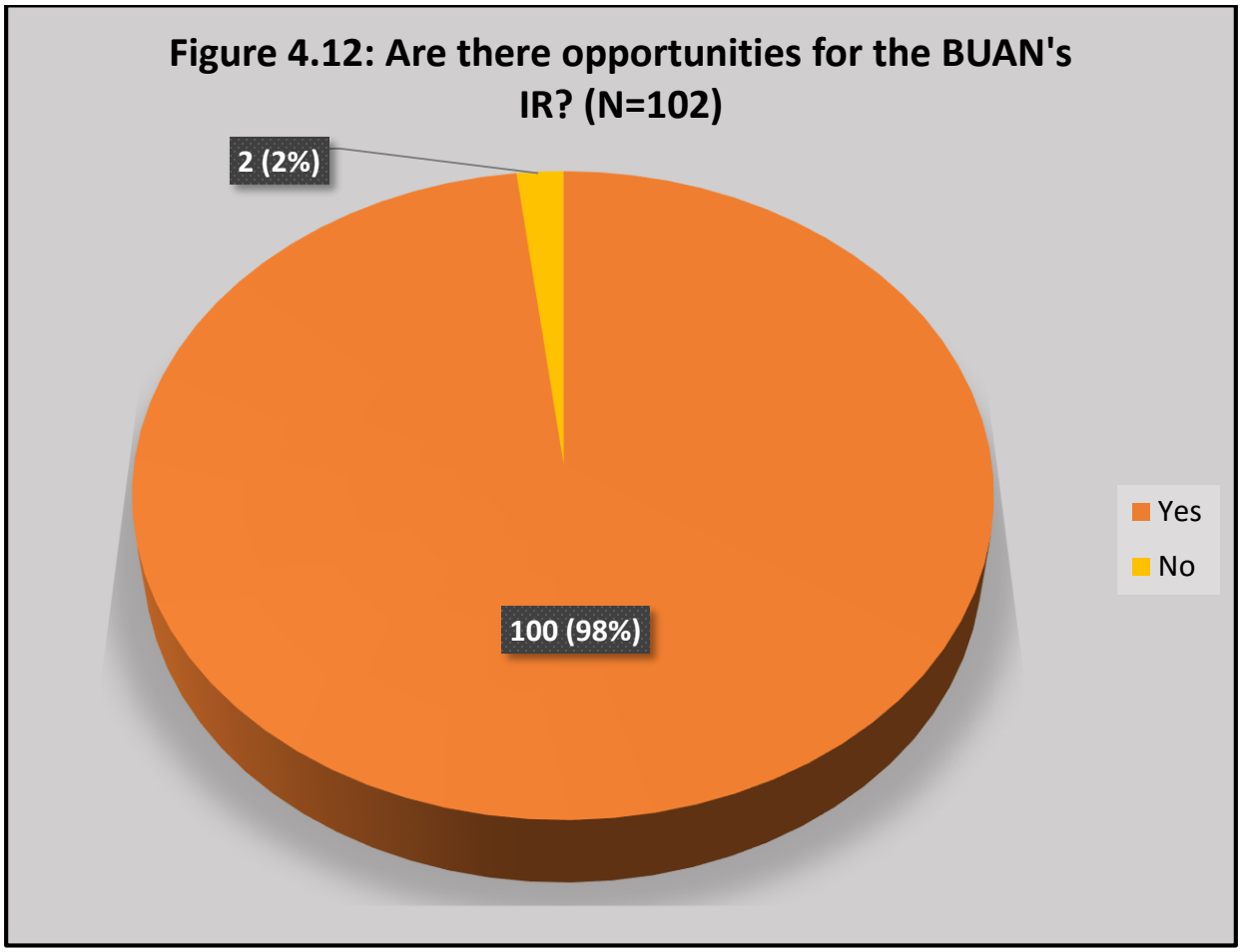


Table 4.18: Elaborations by academics on opportunities for BUAN's IR

Response	Explanation	Frequency
Yes	The IR will enhance visibility and exposure of the University as well as the visibility of research output	28
	The IR will market the intellectual works of BUAN to grow the institution	4
	The IR will facilitate knowledge sharing with BUAN stakeholders in and outside Botswana	4
	The BUAN IR will increase the University's long-term research prospects and open it up to the advent of modern technologies	2
	The BUAN IR will provide research output that is relevant to the Botswana environment	1
	If the planning and establishing of the IR is done properly, it should enhance learning by availing information to students and staff	1
	BUAN as a University is still at its infancy stage so there is room for opportunities	1
	A growing/new institution such as BUAN needs to begin on a correct foundation, hence developments such as the IR will bring opportunities in terms of research	1
	The IR must be upgraded to be at par with international regulations on intellectual property rights and cyber security	1
	BUAN IR will help to expand research at BUAN and access to this research output will be promoted	1
	Sharing locally generated content will assist with information for those tasked with formulating national programs that are aimed at improving the livelihood of Botswana	1
	The repository can assist outside donors by providing inside (situational) information regarding matters relating to agriculture in Botswana	1
	The repository will facilitate scholarly communication within the institution	1
	The IR could be used as a publishing platform for BUAN research output	1

4.2.5.2 Library repository staff responses

Interviewed library repository staff were asked to comment on measures that should be put in place to reinforce the planning and establishing of an institutional repository at the BUAN Library. There are correlations between the librarians' responses and those of the academics. They all

indicated that an IR policy governing the repository should be put in place. Just as academics indicated, the librarians too believe that training to impart knowledge of the BUAN IR on the part of academics, is needed. Librarians also indicated that BUAN must improve the Internet connectivity and speed as academics alluded to in Table 4.16. Interviewed librarians also mentioned that there must be performance measures and time frames to monitor the progress of the IR. They further indicated that there must be a repository committee and workflow to guide the functions of the repository as academics mentioned as well. Lastly, the library repository staff interviewed pointed out that they need continuous training to upgrade their skills and keep abreast of latest repository developments.

When commenting on challenges they foresee for BUAN IR (see Appendix D), interviewed librarians stated that they think that it might take long to put together the IR policy which would delay the planning and establishing of the IR. Like the academics, they too saw the lack of adequate finances to support the project, as a challenge. The interviewed library repository staff also indicated that there is a challenge with publishers in terms of copyright and licensing because, sometimes they write to publishers for copyright clearance but publishers take long to respond and sometimes do not respond at all.

The interviewed librarians were optimistic that the BUAN IR will bring opportunities such as: visibility and discoverability of BUAN research output; citation impact of BUAN research output; dissemination of information to library users; and, providing long term preservation of BUAN research output.

4.2.5.3 IT Staff responses

Although they indicated that they do not have much involvement with the repository, IT staff indicated that with proper training and dedication the Library could improve the planning and establishing of the BUAN IR. They also highlighted that, the new budget for the university covers the upgrading of information technology infrastructure for the University and that the library IT infrastructure is also part of the budget. IT staff were not prompted about what IT preservation

strategies are being put in place for the BUAN IR because they alluded earlier that they are not yet involved with the BUAN IR.

When asked to comment on challenges for the BUAN IR, they pointed out that although BUAN has low bandwidth, Internet speed is not an issue for BUAN only but affects the whole country: "this could be rectified by Broad Band Botswana", one of them said. Importantly, they acknowledged that lack of communication between BUAN IT and the library repository staff, is also a challenge.

When commenting on whether they foresee opportunities for the BUAN IR, the IT staff interviewed stated that they believe that those whom the IR is intended for will benefit once the system is fully functional. They indicated that the IR will aid information sharing among BUAN staff members.

4.2.6 General Comments

At the end of the questionnaire some academics commented generally that the IR project at BUAN appears not to have been led well in the past, but they welcome the BUAN IR. They indicated that institutional repositories are a platform that universities are using to disseminate their research output nowadays, so it is good that BUAN has also adopted the initiative. Some mentioned that academics as sole depositors of the repository content need to embrace the value and purpose of the repository and deposit content. Lastly, they emphasised that the library should train its repository staff regularly to keep them up-to-date with current trends in this area.

In concluding their interviews, library repository staff in their general comments emphasised that an IR policy must be finalised going forward. They reiterated that more training and repository advocacy are needed in BUAN especially for academics. They were all hopeful that matters for the repository will improve for the better once the University is fully restructured, as currently most of the academics are pre-occupied with the restructuring process.

The IT staff did not add any general comment at the end of the interview.

4.3 Chapter summary

This chapter presented the findings of the study based on the critical questions generated to address the study's objective and informed by the five-stage innovation-decision process from the Diffusion on Innovations theory. Findings were based on analysis of data which emanated from a census that was conducted of BUAN academics through a survey using a highly structured questionnaire and from semi-structured interviews with purposively sampled BUAN library repository staff and Information Technology staff. The next chapter discusses the main findings of the study in relation to the study's objective, and its critical questions as well as the innovation-decision process of the Diffusion of Innovations theory.

Chapter 5: Discussion of main findings, conclusions and recommendations

5.1 Introduction

Chapter 4 presented the findings from the questionnaire administered to BUAN academics and semi-structured interviews conducted with purposively selected BUAN library repository staff and BUAN IT staff to ascertain their knowledge, skills and personal attributes required in the planning and establishing of an institutional repository at BUAN. This chapter discusses the main findings of the study in relation to the critical questions, literature reviewed and in the context of the innovation-decision process from the DoI theory (Rogers, 1983: 164).

The main objective of the study was to ascertain staff competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources (BUAN). Critical questions generated to address this objective included: What knowledge, skills and personal attributes are required in the planning and establishing of a successful institutional repository in an academic institution?; Do BUAN staff have the knowledge, skills and personal attributes necessary for planning and establishing a successful repository?; How significant a role does personal attributes such as attitudes and perceptions play in the planning and establishment of an IR at BUAN?; and What measures may be put in place to reinforce the planning and establishing of an institutional repository at the BUAN Library?

5.2 Discussion of main findings

The discussion of the main findings of the study are presented in this chapter in terms of critical questions that guided the study, literature reviewed and in the context of the innovation-decision process from the DoI theory**.**

5.2.1 Knowledge, skills and personal attributes required in the planning and establishing of a successful institutional repository in an academic institution

The literature reviewed and findings from this study indicate that academics' decision to participate in contributing content to the institutional repository of an academic institution is affected in many ways, including: awareness of and skills in how submissions happens in a repository environment and personal attributes that individual academics have towards the IR. The literature shows that a combination of discipline-specific knowledge, generic skills and personal attributes are required for effective planning and establishing of institutional repositories in the 21st academic library environment (Nonthacumjane, 2011; Raju, 2014). Table 4.8 in Chapter 4 summarised the knowledge, skills and personal attributes gleaned from the literature (Robinson 2008; Creaser et al. 2010; Nonthacumjane, 2011; Tanloet & Tuamsuk, 2011; 2016; Raju, 2014; Calarco, Shearer & Tate; Harvey & Oliver, 2016). It is common in the literature that, knowledge of metadata and metadata standards is critical among competencies for the planning and establishing of institutional repositories (Nonthacumjane, 2011; Calarco, Shearer &Tate, 2016; Harvey and Oliver, 2016).

An interesting observation from the literature is the emergence of knowledge of research data management practices which the interviewed librarians did not mention. Although this is an important trend affecting institutional repositories emerging from the literature, it would seem that the BUAN library repository staff have not yet established the importance of this new trend. In reiteration of this importance, the Canadian Association of Research Libraries (2010: 5) explain that academic librarians are coming up with new roles in support of research data management and preservation. Libraries are not just in the business of gathering, organising, and providing access to information, "they are also actively creating knowledge, and proactively assisting their institutions manage their research outputs as evidenced by the dramatic worldwide growth of institutional repositories" (Canadian Association of Research Libraries, 2010: 5).

Despite the BUAN library repository staff indicating that they know the kind of knowledge, skills and personal attributes required for the planning and establishing of an institutional repository in an academic institution (see Table 4.6), they did not mention some of the knowledge and skills reflected in the literature such as: analysis and documentation skills; advocacy, training & support

skills which include the ability to develop an advocacy programme to address the full spectrum of stakeholders; and, ability to validate and authenticate migrated data (Robinson, 2008; Harvey and Oliver, 2016).This means that further knowledge and skills development are required to empower BUAN library repository staff, to execute the repository functions efficiently. However, it was it was encouraging to find that all three BUAN repository librarians have information technology related qualifications which indicates that they have expertise on IT related matters and this, coupled with the support from BUAN's IT staff supporting the repository, would be of value in the planning and establishing of the IR at BUAN.

It must be acknowledged that the interviewed repository staff also provided responses to the interview questions that reflected in the literature reviewed (see Table 4.8). Interviewed librarians indicated that they know who the stakeholders of the BUAN IR are, and they outlined the knowledge and skills sets that these stakeholders should possess. For the BUAN Library to effectively achieve the planning and establishing of a successful IR, the researcher believes, based on the findings from the literature reviewed, that, a combination of competencies (discipline-specific knowledge, generic skills and personal attributes) is required (Nonthacumjane, 2011; Raju, 2014). The researcher believes library repository staff and other stakeholders should possess this combination of competencies for planning and establishing of an IR.

The literature reviewed and interviewed librarians concurred that, personal attributes are critical competencies in the planning and establishing of an IR in an academic institution. Self-motivation seems to dominate the personal attributes that staff should possess in the planning and establishing of IR, not only on the part of repository staff to see the repository succeed but also on the part of academics and researchers in contributing to the repository. The literature also indicates that staff dealing with the repository should be determined, have positive attitudes, be adaptable and should be fostering of change. Negative attitudes towards an innovation such as a repository, especially on the part of academics and researchers, as Rogers (1983: 164) states, could lead to them not adopting an innovation.

In summary, among the knowledge, skills and personal attributes that emerged from this study as being required in the planning and establishing of a successful repository in an academic

institution, the following emerged as being critical: knowledge of metadata and metadata standards; knowledge of research data management practices; Knowledge of preservation planning and implementation; knowledge of open source software and open standards; knowledge of information management systems; analysis and documentation skills; advocacy, training & support skills which include the ability to develop advocacy programme to address the full spectrum of stakeholders; ability to validate and authenticate migrated data; leadership skills; self-motivation; fostering change; adaptability; enthusiasm and initiative; determination; and, positive attitudes.

5.2.2 Do BUAN staff (academics and relevant support staff) have the knowledge, skills and personal attributes necessary for planning and establishing a successful institutional repository at BUAN?

It is encouraging to record that all six academic departments in BUAN were represented in this study. Most importantly the findings have shown that there is intellectual content produced within BUAN (see Table 4.3) which is potential content to be deposited into the BUAN IR. The findings show that 25 (23%) from the 108 academics indicated that they have graduated masters students and it was mostly professors - a reflection of the dominance of professorial staff in the graduation of research students and that the more junior academic staff have yet to achieve this output in their academic careers.

The level of awareness among BUAN academics of the institutional repository concept in general was higher (73% of 108 academics) than the level of awareness among BUAN academics of the BUAN Institutional Repository (16% of the 108 academics). The level of awareness of the BUAN IR is very low. This findings reflect how advocacy and outreach work is needed at BUAN among academics to make them aware of the BUAN‘s institutional repository. As Rogers (1983: 164) explains in the innovation-decision process of the DoI theory, to diffuse an innovation to people, awareness of the innovation is the first step that organisations should do. Without awareness the innovation cannot succeed. BUAN library repository staff should raise awareness of the BUAN IR, including aspects such as: copyright and intellectual property issues, understanding of the concept of open access (that is, free and full access to research output), understanding funder

policies/mandates on open access publishing of research output and awareness of the role of BUAN's Institutional Repository in promoting visibility and discoverability of the research output of the institution.

Despite academics indicating that they are aware of the institutional repository concept in general the findings of this study indicate that knowledge (awareness) of BUAN IR by academics seems to be a contributing factor to the slow planning and establishing of IR at BUAN. Regardless of age categories of academics the findings reflect that a worryingly large majority of 91 (84%) of the 108 respondents pointed out that they are not aware of the BUAN Institutional Repository, including those age groups (see Figure 4.3) whom we believe should accept technology innovations such as an IR, readily. Academics who acknowledged that they are aware of BUAN Institutional Repository indicated in large part, that they came to know about BUAN IR via ad hoc means (see Table 4.9) and not via a formal meeting, workshop, seminar or any other forum that was conducted by the BUAN Library to introduce the BUAN IR to academics and other stakeholders. More seriously, an overwhelming majority of 95% of the 108 academics indicated that they did not receive any training on depositing in the BUAN Institutional Repository and issues related to this. These findings are a definite indication that much repository advocacy and outreach is required at BUAN.

Despite BUAN academics, in large part, having a lack of knowledge of the BUAN IR, findings in this study revealed that they have useful knowledge required to contribute to a successful BUAN Institutional Repository: 72% of 68 academics indicated that they have knowledge of intellectual property issues; 62% indicated that they have understanding of the concept of open access (that is, free and full access to research output); and, 44% of them show that they have understanding of funder policies/mandates on open access publishing of research output. Academics also indicated that they have certain skills that are required to contribute to the planning and establishing of a successful IR at BUAN: 74% of 74 academics indicated that they have the ability to negotiate copyright issues with publishers, while 41% indicated that they know how to search for copyright policies in databases such as *Sherpa-Romeo* or in journal homepages. Not surprisingly ingesting or updating content such as journal articles and updating content in the repository (for example, replacing pre-print articles with final published versions) registered very

low percentages of 7% each as academics surveyed have already indicated that they, in large part, have not received any training on the BUAN IR . Hence serious repository training for academics is necessary.

Findings reveal that the majority of academics surveyed (76%) were interested in participating or depositing into the BUAN IR and believed they should make time to deposit and update submissions to the BUAN 's IR; 75% of academics indicated that they would make themselves available for necessary repository training for academics and researchers; 69% expressed feeling strongly about the visibility and discoverability of BUAN's research output, while 71% of indicated that they value the long-term preservation of research output that BUAN's Institutional Repository offers (see Table 4.12) . These findings are indicative of willingness on the part of BUAN academics and researches to contribute to the planning and establishing of a successful IR at BUAN. The BUAN Library should leverage the opportunity that this willingness presents to make academics aware of the BUAN IR and to train them for participation in the repository.

The interviews revealed that BUAN library repository staff seem to be confident that they are knowledgeable enough to contribute to a successful IR at BUAN. They indicated that they have, in large part, the knowledge, skills and personal attributes (see Table 4.6) – required to plan and establish an institutional repository. However, they did acknowledge that they need support and motivation from Senior Library Management and other relevant stakeholders in terms of continuing repository training to keep up with the latest trends, for example, research data management, alluded to earlier. It is the researcher's view that BUAN library repository staff need further training, especially on issues of advocacy, training of repository participants, outreach and support, and new repository developments to more fully contribute to the planning and establishing of a successful institutional repository at BUAN. According to the Canadian Association of Research Libraries (2010: 5) librarians in an academic library are expected to be technologically-savvy. They are expected to thrive in the digital environment, and to be actively engaged in the exploration and implementation of innovative technologies like institutional repositories (Canadian Association of Research Libraries, 2010: 5). Hence the need for management support of repository staff for purposes of staying abreast of latest repository developments.

While interviewed IT staff acknowledged that they are aware of the existence of BUAN IR, they somewhat distanced themselves from the BUAN IR indicating that all the operations of the BUAN IR are handled by library repository staff. They claimed that they do not have the knowledge and skills required for planning and establishing of an institutional repository. Perhaps BUAN library repository staff should engage more with the BUAN IT staff because they are the ones who purchase the IT infrastructure and they have the IT expertise that might be useful in the planning and establishing of BUAN IR. The hands-off attitude of the BUAN IT staff could be suggestive of a lack of communication and engagement with IR stakeholders by BUAN library repository staff. Hence the need for the BUAN library to engage stakeholders, including BUAN IT staff, for better management of the repository.

To summarise this section, it would appear that while a good body of knowledge, skills and personal attributes on the part of academics/researchers, library repository staff and IT staff to plan and establish an IR at BUAN, does exist, there is room for improvement particularly in the areas of: repository advocacy and outreach; repository training for academics; management and general institutional support of library repository staff in terms of on-going training to keep abreast of latest repository developments; a more positive attitude on the part of BUAN IT staff towards the IR; and better communication and engagement between BUAN's library repository staff its IT staff.

5.2.3 The significance of the role of personal attributes such as attitudes and perceptions in the planning and establishing of an IR at BUAN

As the innovation-decision process of the DoI theory (Rogers, 1983: 164) indicates, an individual forms a favourable or unfavourable attitude toward an innovation in order to pursue or not pursue that innovation. The majority of BUAN academics (68% of 96 who responded to the issue) believed that personal attributes play a significant role in the planning and establishing of the IR. This is indicative of a favourable attitudes towards the BUAN IR. Academics cited statements such as: a negative attitude would result in minimal participation and an ineffective IR system; when one does not value the repository one will not be willing to contribute one's research output to the repository. This is encouraging looking forward to planning and establishing of the

BUAN IR because negative attitudes could impact negatively on the IR. This finding would seem to indicate that, the reason for slow adoption of the BUAN IR by academics is not attitudes and perceptions of academics about the IR but instead knowledge (awareness) of academics about the BUAN IR.

It is not surprising that a very large majority of 91% of the 108 academics admitted that they have not deposited into the BUAN IR because it has already been established in the findings of this study that academics are, in large part, not aware of the BUAN IR and have not received any training on the BUAN IR. This is of concern because academics are the primary depositors of content for the BUAN IR. While many reasons were provided by academics for not ingesting, the 86% response (out of 98 responses to this issue) - for lack of knowledge and skills on how to ingest/deposit content into the BUAN IR - is significant and consistent with earlier responses relating to lack of training on how to deposit material into the IR. On the whole then, academics are receptive to BUAN IR, but have yet to grasp the workings of the BUAN IR.

Like the academics surveyed, interviewed librarians (repository staff) believe that personal attributes such as perceptions and attitudes play a significant role in the planning and establishing of the IR at BUAN. They emphasised that every stakeholder who is part of the IR should be on board: “positive attitude will give positive results working with the repository”, remarked one librarian. They believe that if academics have negative attitudes towards the IR, the project would not succeed. They indicated that currently they cannot tell if IR stakeholders have certain attitudes towards the IR because the BUAN IR is not yet fully operational.

It would seem then that both BUAN academics and repository staff concur that that personal attributes such as attitudes and perceptions play a significant role in the planning and establishment of an IR at BUAN. While a largely positive attitude towards the idea of an IR does exist among IR stakeholders at BUAN, this needs to be reinforced and brought out through concerted awareness and advocacy work as well as repository training for academics and communication and engagement about the repository among BUAN repository stakeholders.

5.2.4 Measures that may be put in place to reinforce the planning and establishing of an institutional repository at the BUAN Library

BUAN academics foresee a future for the BUAN Institutional Repository - 98% of the 108 indicated so. In their elaborations academics revealed that the questionnaire survey and content it carried in its structured items were an eye opener for academics about the BUAN IR and open access. Academics indicated that the library repository staff should train academic staff members and induct inexperienced staff members about the BUAN IR, and that the BUAN library repository staff should have a rigorous campaign for BUAN's institutional repository, and assign a specific person to take staff along in depositing content into the BUAN IR. A recurring theme in the study's findings seem to be that training academics on the BUAN IR would encourage and enable academics to deposit into the BUAN IR.

There was also the suggestion that policies could be put in place to mandate staff to deposit into the BUAN IR and that academic supervisors could enforce the BUAN IR through performance management reviews to incentivise academics to contribute to the IR. Some academics suggested that top depositors could be rewarded to motivate other academics to deposit.

Challenges alluded to by academics included: low internet bandwidth; no policy in place to guide the planning and establishing of the repository; and shortage of funds to support the IR project. BUAN as an institution then needs to upgrade its Internet infrastructure and provide other necessary support to encounter other challenges mentioned.

BUAN library repository staff also believe that an IR policy must be finalised to guide the functions of the repository. Most importantly they indicated that academics and relevant support staff must be trained, motivated and incentivised to encourage contribution to institutional repository at BUAN. They believe that in order for the BUAN IR to be successful there has to be a dedicated team with strong leadership as someone has to take responsibility to lead the project with a workflow and assigned roles and responsibilities. Findings here also revealed that time-frames should be established to monitor repository progress.

From the findings it evident then that measures to be put in place to reinforce the planning and establishing of an IR at BUAN include: training academics and other relevant stakeholders to

deposit into the IR; putting policies in place to mandate staff to ingest into the IR; motivating and incentivising academics to deposit via institutional processes and procedures; engaging with challenges currently facing the BUAN IR and finding solutions to these; and, providing strong leadership for the IR project with workflows and roles and responsibilities as well as time-lines for monitoring repository progress.

5.3 Conclusions

Based on the preceding discussions, the study comes to the following conclusions:

- Among the knowledge, skills and personal attributes required in the planning and establishing of a successful repository in an academic institution, the following are critical: knowledge of metadata and metadata standards; knowledge of research data management practices; knowledge of preservation planning and implementation; knowledge of open source software and open standards; knowledge of information management systems; analysis and documentation skills; advocacy, training & support skills which include the ability to develop advocacy programme to address the full spectrum of stakeholders; ability to validate and authenticate migrated data; leadership skills; self-motivation; fostering change; adaptability; enthusiasm and initiative; determination; and, positive attitudes.

- While a good body of knowledge, skills and personal attributes essential for planning and establishing a successful institutional repository at BUAN (on the part of academics, researchers, library repository staff and IT staff) currently exists, there is room for improvement particularly in the following areas: repository advocacy and outreach; repository training for academics; management and general institutional support of library repository staff in terms of on-going training to keep abreast of latest repository developments; and, better communication and engagement between BUAN library repository staff and IT staff.

- Personal attributes such as attitudes and perceptions play a significant role in the planning and establishment of an IR at BUAN. Hence this needs to be reinforced and highlighted

through concerted awareness and advocacy work as well as repository training for academics, and regular communication and engagement about the repository among BUAN library repository staff and BUAN IT staff.

- Measures to be put in place to reinforce the planning and establishing of an IR at BUAN include, amongst others: training academics and other relevant stakeholders to deposit into the IR; putting policies in place to mandate staff to ingest into the IR; motivating and incentivising academics, via institutional processes and procedures, to deposit into the IR; engaging with challenges currently facing the BUAN IR and finding solutions to these; and, providing strong leadership for the IR project with workflows and roles and responsibilities as well as time-lines for monitoring repository progress.

5.4 Recommendations

Based on the discussions in this chapter and the conclusions drawn, the study makes the following recommendations:

- The BUAN Library, with the support of the University, should put in place on-going training and advocacy interventions to close existing knowledge, skills and other competency gaps among library repository staff, BUAN IT staff as well as academics and researchers in order to facilitate the planning and establishing of a successful institutional repository at BUAN.

- A BUAN IR policy should be put into place to guide depositing of content into the repository (research output as well as students' theses and dissertations), to help find solutions to challenges confronting the IR, to promote strong leadership of an IR project with workflows, roles and responsibilities, as well as time-lines for monitoring progress in the growth of the repository.

- Further study needs to be undertaken, perhaps this time including the repositories of other African regions for purposes of comparison, benchmarking and quality assessment. Further

research could also include technology aspects of the repository to ascertain how they affect the planning and establishing of institutional repositories in higher education institutions.

5.5 Chapter summary and general conclusion

This chapter discussed the main findings of the study in terms of the critical questions guiding the study and in relation to the literature, including the innovation-decision process from the Diffusion of Innovations theory informing the study. Based on the discussion, conclusions were drawn and recommendations were made.

The study's convergent parallel mixed methods approach within a pragmativist paradigm allowed for the collection of both quantitative and qualitative data from BUAN academics, library repository staff and IT staff to address the study's main objective and its four research questions. The researcher is satisfied that the research problem set out at the beginning of this report has been addressed via the study's primary objective and the research questions generated to address this objective, being responded to.

The researcher believes that this study is timeous as BUAN, an emerging specialist higher education institution, recently separated from the University of Botswana, grapples with the establishment of a functional institutional repository. Apart from its findings, conclusions and recommendations which could assist BUAN management, library staff, academics, IT staff and repository staff at BUAN and elsewhere towards an improved institutional repository, the study itself raised awareness of IRs among BUAN academics. In addition to this contribution to practice, from a theory point of view, this study comes at a time when there is a burgeoning of IRs globally as the world sees this green route to open access as an important contributor to global knowledge sharing. Hence this study adds to a growing body of knowledge on institutional repositories.

References

Abbott, M. & McKinney, J. 2013. *Understanding and applying research design.* New Jersey: John Wiley & sons.

Armstrong, M. 2006. *Human resource management practice.* 10th ed. London: Kogan Page.

Australian Bureau of Statistics. 2013. *Census and sample*. Available: http://www.abs.gov.au/websitedbs/a3121120.nsf/home/statistical+language+-+census+and+sample [2017, August 14].

Babbie, E. 2004. *The practice of social research*. 10th ed. New York: Wadsworth/Thomson Learning.

Babbie, E. 2016. *The practice of social research*. 14th ed. Boston: Cengage Learning.

Bellinger, G., Castro, D. and Mills, A. 2004. *Data, information, knowledge, and wisdom*. Available: file:///C:/Users/Student/Downloads/ackoffDiscussion.pdf [2017, May 3].

Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities. 2003. Available: http://openaccess.mpg.de/Berlin-Declaration [2017, May 3].

Bjork, B., Laakso, M., Welling, P., Paetau, P. 2013. Anatomy of green open access. *American Society for Information Science and Technology*. Available: http://www.openaccesspublishing.org/apc8/Personal%20VersionGreenOa.pdf [2017, June 13].

Botswana College of Agriculture. 2015. *About us*. Available: www.bca.bw [2017, April 28].

Botswana University of Agriculture and Natural Resources Act, no. 12 of 2015. 2015. Gaborone: Government Printer.

Botswana University of Agriculture and Natural Resources, Human Resources Office. 2017. Personal communication, 23 Nov., Botswana University of Agriculture and Natural Resources, Gaborone.

Botswana University of Agriculture and Natural Resources internal directory. 2017. Gaborone: Botswana University of Agriculture and Natural Resources.

Budapest Open Access Initiative. 2012. *Ten years on from the Budapest Open Access Initiative: setting the default to open*. Available: http://www.budapestopenaccessinitiative.org/boai-10-recommendations [2017, March 29].

Bustos-González, A., Fernandez-Porcel, A. & Johnson, I.M., 2007. Guidelines for the creation of institutional repositories at universities and higher education institutions. *E-prints in Library and Information Science*. Available: http://eprints.rclis.org/13512/ [2017, May 2].

Canadian Association of Research Libraries. 2010. *Core competencies for the 21st Century CARL librarians, CARL*. Available: http://www.carl-abrc.ca/doc/core_comp_profile-e.pdf [2018, February 7]

Calarco, P., Shearer, B.S & Tate, D. 2016. Librarians' competencies profile for scholarly communication and open access. *Joint Task Force on Librarians' Competencies in Support of EResearch and Scholarly Communication.* June 2016. Available: https://www.coar-repositories.org/files/Competencies-for-ScholComm-and-OA_June-2016.pdf [2018, February 6]

Centre for Innovation in Research and Teaching. 2017. *Choosing a mixed method design*. Available:

https://cirt.gcu.edu/research/developmentresources/research_ready/mixed_methods/choosing_design [2018, July 9].

Chan, D.C. 2006. Core competencies and performance management in Canadian public libraries. *Library Management*. 27(3): 144-153. DOI: 10.1108/01435120610652897.

Christian, G.M. 2008. Issues and challenges to the development of open access institutional repositories in academic and research institutions in Nigeria. *A paper prepared for the International Development Research Centre (IDRC)*. Available: https://idlbnc.idrc.ca/dspace/bitstream/10625/36986/1/127792.pdf [2015, October 2].

Creaser, C. 2010. Open access to research outputs—institutional policies and researchers' views: results from two complementary surveys. *New Review of Academic Librarianship.* 16(1): 4-25. DOI: 10.1080/13614530903162854.

Creaser, C., Fry, J., Greenwood, H., Oppenheim, C., Probets, S., Spezi, V. & White, S. 2010. Authors' awareness and attitudes toward open access repositories. *New Review of Academic Librarianship*. 16 (S1): 145-161. DOI: 10.1080/13614533.2010.518851.

Creswell, J.W. 2014. *Research design: qualitative, quantitative, and mixed methods approaches*. 4th ed. Los Angeles: Sage.

Crow, R. 2002. *The case for institutional repositories*: *a SPARC position paper, 2002.* Washington, DC*: SPARC*. Available: http://www. arl. org/sparc/bm~ doc/ir_final_release_102. pdf11. [2017, March 10].

Davis, F. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*. 13(3): 319-340. Available: http://www.jstor.org/stable/249008 [2018, February 17].

Dlamini, N.N. & Snyman,M. 2017. Institutional repositories in Africa: obstacles and challenges. *Library Review*. 66 (6/7): 535-548. DOI:10.1108/LR-03-2017-0021.

Dulle, F.W., Minishi-Majanja, M.K. and Cloete, L.M. 2010. Factors influencing the adoption of open access scholarly communication in Tanzanian public universities. *Proceedings of the 76th IFLA General Conference and Assembly.* 10-15 August 2010. Gothenburg, Sweden. Available: http://www.ifla. org/files/hq/papers/ifla76/138-dulle-en.pdf [2017, April 25].

Fink, A. 2005. *Conducting research literature reviews: from internet to paper*. 2nd ed. California: Sage Publications.

Foster, N.F. & Gibbons, S. 2005. Understanding faculty to improve content recruitment for institutional repositories. *D-Lib Magazine.* 11(1). Available: https://eric.ed.gov/?id=ED490029 [2018, February 17].

Gosh, M. 2009. Information professionals in the open access era: the competencies, challenges and new roles. *Information Development*. *25*(1): 33-42. DOI: 10.1177/0266666908098075.

Hahn, S.E. & Wyatt, A. 2014. Business faculty's attitudes: open access, disciplinary repositories, and institutional repositories. *Journal of Business & Finance Librarianship*. 19(2): 3-113. DOI: 10.1080/08963568.2014.883875.

Harvey, D.R & Oliver, G. 2016. *Digital curation*. Chicago: American Library Association

Ivwighreghweta, O. 2012. An investigation to the challenges of institutional repositories development in six academic institutions in Nigeria. *International Journal of Digital Library Services.* 12 (4). Available: http://www.ijodls.in/uploads/3/6/0/3/3603729/vol-2_issue-4_part-1.pdf [2018, July 5].

Jain, P., Bentley, G. & Oladiran, M.T. 2009. The role of institutional repository in digital scholarly communications. *Proceedings of African Digital Scholarship and Curation Conference*. 12-14 May 2009. Pretoria, South Africa. Available: http://www.library.up.ac.za/digi/docs/jain_paper.pdf [2017, April 25].

Katz, E., Levin, M. & Hamilton, H. 1963. Traditions of research on the diffusion of innovation. *American Sociological Review*. 28(2): 237-252. Available: http://www.jstor.org/stable/2090611 [2017, May 7].

Kelly, K. 2006. From encounter to text: collecting data in qualitative research. *In Research in practice: applied methods for the social sciences.* T.M. Blanche, K. Durrheim & D. Painter, Eds. Cape Town: University of Cape Town Press. 286-319.

Kinsley, D. 2008. Those who don't look don't find: disciplinary considerations in repository advocacy. *International Digital Library Perspectives*. 24(4): 204-218. DOI: 10.1108/10650750810914210.

Kumar, R. 2005. *Research methodology: a step-by-step guide for beginner*. 2nd ed. London: Sage.

Lynch, C.A. 2003. Institutional repositories: essential infrastructure for scholarship in the digital age. *Portal: Libraries and the Academy*. 3(2): 327-336. DOI:10.1353/pla.2003.0039.

Mammo, Y. & Ngulube, P. 2015. Academics' use and attitude towards open access in selected higher learning institutions of Ethiopia. *Information Development*. 31(1): 13-26. DOI: 10.1177/0266666913500977.

Mariam-Webster online dictionary. 2017a. 'Skills'. Available: https://www.merriam-webster.com/dictionary/skills [2017, May 1].

Mariam-Webster online dictionary. 2017b. 'Attitudes'. Available: https://www.merriam-webster.com/dictionary/attitudes [2017, May 1].

Maree, K. 2007. *First steps in research. Pretoria*: Van Schaik.

Moahi, K. 2009. Institutional repositories: towards harnessing knowledge for African development. *Proceedings of First International Conference on African Digital Libraries and Archives (ICADLA 1*). 1-3 July 2009. Addis Ababa, Ethiopia. Available: http://wiredspace.wits.ac.za/bitstream/handle/10539/8950/35%20Moahi.pdf?sequence=1 [2017, May 4].

Neuman, L.W. 2006. *Social research methods: qualitative and quantitative approaches*. 6th ed. Boston: Pearson.

Ngulube, P. 2015. Trends in research methodological procedures used in knowledge management studies. *African Journal of Library, Archives and Information Science*. 25(2): 125-143. DOI: 10.13140/RG.2.1.2778.4162.

Nonthacumjane, P. 2011. Key skills and competencies of a new generation of LIS professionals. *IFLA Journal*. 37(4): 280-288. DOI: 10.1177/0340035211430475.

Obuh, A.O. 2013. Attitudes towards the use of open access scholarly publications: the position of LIS lecturers in Southern Nigeria. *The Social Sciences.* 8(2): 153-159. Available: http://docsdrive.com/pdfs/medwelljournals/sscience/2013/153-159.pdf [2017, May 7].

Oxford English living dictionaries. 'Knowledge'. 2017. Available: https://en.oxforddictionaries.com/definition/knowledge [2017, May 7].

Pickard, A. J. 2013. *Research methods in information*. 2nd ed. London: Facet Publishing.

Punch, K.F. 2014. *Introduction to social research: quantitative & qualitative approaches*. 3rd ed. Los Angeles: Sage.

Raju, J. 2014. Knowledge and skills for the digital era academic library. *The Journal of Academic Librarianship*. 40(2): 163-170. DOI: 10.1016/j.acalib.2014.02.007.

Raju, R. & Raju, R. 2009. The progression from repositories to institutional repositories: a comparative examination of repositories at the Durban University of Technology and Stellenbosch University. *Proceedings of First International Conference on African Digital Libraries and Archives*. 1-3 July 2009. Addis Ababa, Ethiopia Available: http://scholar.sun.ac.za/handle/10019.1/8415 [2017, April 25].

Raju, R., Smith, I., Gibson, H. & Talliard, P. 2012. Open access: are we there yet?: the case of Stellenbosch University, South Africa. *South African journal of libraries and information science*. 80(2). DOI: 10.7553/80-2-29.

Reinsfelder, T.L. & Anderson, J.A. 2013. Observations and perceptions of academic administrator influence on open access initiatives. *The Journal of Academic Librarianship.* 39(6): 481-487. DOI: 10.1016/j.acalib.2013.08.014.

Relmer, K.D & Ryzin V.G. 2011. *Research methods in practice: strategies for description and causation*. California: Sage.

Robinson, M. 2008. *Institutional repositories: staff and skills requirements*. Available: http://sherpa.ac.uk/documents/sherpaplusdocs/notts-Repository%20Staff%20and%20Skills.pdf [2017, May 7].

Rogers, E.M. 1983. *Diffusion of innovations*. 3rded. New York: The Free Press: Available: https://teddykw2.files.wordpress.com/2012/07/everett-m-rogers-diffusion-of-innovations.pdf [2017, May 7].

Sekati, A. 2009. *About BCA library*. Available: http://library.bca.bw [2017, March 10].

Sharma, A.K., Meichieo, K. & Saha, N.C. 2008. Institutional repositories and skills requirements, a new horizon to preserve the intellectual output: an Indian perspective. INFLIBNET's Convention Proceedings. Available: http://ir.inflibnet.ac.in/handle/1944/1145 [2018, July 5].

Sharma, R.K. & Vishwanathan, K.R. 2001. Digital libraries: development and challenges. *Library Review*. 50(1): 10-15. DOI: 10.1108/00242530110363190.

Simon, M. & Goes, J. 2013. Scope, limitations, and delimitations. Available: http://dissertationrecipes.com/wp-content/uploads/2011/04/limitationscopedelimitation1.pdf [2017, June 15].

Stanger, N. & McGregor, G. 2006*. Hitting the ground running: building New Zealand's first publicly available institutional repository.* Available: https://ourarchive.otago.ac.nz/bitstream/handle/10523/915/dp2006-07.pdf?sequence=3&isAllowed=y [2017, June 21].

Sutradhar, B. 2006. Design and development of an institutional repository at the Indian Institute of Technology Kharagpur. *Program*. 40(3): 244-255. DOI: 10.1108/00330330610681321.

Tanloet, P. & Tuamsuk, K. 2011. Core competencies for information professionals of Thai academic libraries in the next decade (A.D. 2010-2019). *The International Information & Library Review*. 43(3): 122-129. DOI: 10.1016/j.iilr.2011.07.0005.

Tarrago, N.S. & Molina, J.C.F. 2008. Open access journals: knowledge and attitude among Cuban health researchers. *International Journal of Cuban Health & Medicine.* 10(1): 18-21. Available: http://www.medigraphic.com/pdfs/medicreview/mrw-2008/mrw081h.pdf [2017, May 7].

Thomas, S. 2004. Pilot testing the questionnaire. In *Using web and paper questionnaires for data-based decision making: from design to interpretation of the results.* Thousand Oaks: Sage. 107-119.

Ukwoma, S.C. & Dike, V.W. 2008. Academics' attitudes toward the utilization of institutional repositories in Nigerian universities. *Libraries and the Academy*. 17 (1): 17-32. DOI: 10.1353/pla.2017.0002.

Utulu, S.C. & Bolarinwa, O. 2009. Open access initiatives adoptiongm by Nigerian academics. *Library Review.* 58(9): 660-669. DOI: 10.1108/00242530910997946.

Watson, S. 2007. Authors' attitudes to, and awareness and use of, a university institutional repository. *Serials.* 20(3): 225–230. DOI: 10.1629/20225.

Yang, Z. & Li, Y. 2015. University faculty awareness and attitudes towards open access publishing and the institutional repository: a case study. *Journal of Librarianship and Scholarly Communication*. 3(1). DOI: 10.7710/2162-3309.1210.

Yin, R.K. 2009. *Case study research: design and methods*. 4th ed. California: Sage Publications.

Appendix A

Staff competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources

Informed consent for interview with library repository staff member

Purpose

My name is Tlhalefo Metlhaleng. I am an MPhil (Digital Curation) student in the Library and Information Studies Centre at the University of Cape Town. I am carrying out a study on 'Staff competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources'. As part of this study I would like to interview staff working with the repository within the BUAN Library and hence would appreciate your participation.

Agreement

By signing the consent form below you are agreeing to grant me an interview session with you. For the purpose of accurate capture of data collected, the interview session will be recorded (with your permission) using an audio recorder. You will be asked questions relating to the above mentioned study. Information collected will be treated with uttermost confidentiality by anonymising of data during the reporting process and by removing any identifying information that is likely to link the data to participants. Participation is voluntary and may be withdrawn at any stage in the research process.

Contacts

You will be given a copy of this consent form for your records. If you have any questions or concerns regarding your rights as a participant in the study or any other questions relating to the study, you may contact me or my supervisor using the following information:

Tlhalefo Metlhaleng (researcher)	A/Prof. Jaya Raju (supervisor)
Email: tmetlhaleng@gmail.com	jaya.raju@uct.ac.za
0026772863115	+27 216504546

Informed consent

I the undersigned, hereby consent to being a participant in the research study described above. I understand the nature of the research and its purpose. I have had the opportunity to ask clarification questions relating to the study and my involvement in it. **I agree/do not agree** to the interview being recorded.

Signature of the researcher…….. Date……

Signature of participant …….. Date……

Appendix B

Staff competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources

Informed consent for interview with information technology (IT) staff

Purpose

My name is Tlhalefo Metlhaleng. I am an MPhil (specialising in Digital Curation) student in the Library and Information Studies Centre at the University of Cape Town. I am carrying out a study on 'Staff competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources (BUAN)'. As part of this study I would like to interview staff working with the repository within the BUAN information technology (IT) department and hence would appreciate your participation.

Agreement

By signing the consent form below you are agreeing to grant me an interview session with you. For the purpose of accurate capture of data collected, the interview session will be recorded (with your permission) using an audio recorder. You will be asked questions relating to the above-mentioned study. Information collected will be treated with utmost confidentiality by anonymising of data during the reporting process. Participation is voluntary and may be withdrawn at any stage in the research process.

Contacts

You will be given a copy of this consent form for your records. If you have any questions or concerns regarding your rights as a participant in the study or any other questions relating to the study, you may contact me or my supervisor using the following information:

Tlhalefo Metlhaleng (researcher)	A/Prof. Jaya Raju (supervisor)
Email: tmetlhaleng@gmail.com	jaya.raju@uct.ac.za
0026772863115	+27 216504546

Informed consent

I, the undersigned, hereby consent to being a participant in the research study described above. I understand the nature of the research and its purpose. I have had the opportunity to ask clarification questions relating to the study and my involvement in it. **I agree/do not agree** to the interview being recorded.

Signature of the researcher…… Date……..

Signature of participant …… Date…….

Appendix C

Staff competencies in the planning and establishing of an institutional repository at the Botswana University Agriculture and Natural Resources

Questionnaire for academics

Preamble

My name is Tlhalefo Metlhaleng. I am an MPhil (specialising in Digital Curation) student in the Library and Information Studies Centre at the University of Cape Town. I am carrying out a study on 'Staff competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources'. My study is being supervised by Associate Professor Jaya Raju. As part of this study a census is being conducted of all academics at the Botswana University of Agriculture and Natural resources (BUAN). I would therefore appreciate your participation.

An institutional repository (IR) is a web-based searchable database of scholarly material. The aim of an IR is to collect, preserve and make accessible the intellectual output of an academic institution and its member institutions. Content deposited in an IR could include: working papers, pre-prints or post-prints of articles, published articles, technical reports, masters and PhD theses, data sets and conference proceedings. BUAN began its institutional repository, called *BCAgrispace*, in 2012 and has began collecting the intellectual output of the institution. However BUAN's IR is not yet on the World Wide Web due to different challenges.

The questionnaire which follows has been prepared to survey BUAN academics' awareness, attitudes and perceptions towards the institutional repository (IR). Your participation in the study is highly appreciated. Every effort will be made to ensure your anonymity and the confidentiality of the information you provide, during the reporting of findings. Participation is voluntary and may be withdrawn at any time. It should not take you more than 20 minutes to complete this questionnaire.

If you have any queries regarding this questionnaire or the study, please do not hesitate to contact me using the details below:

Tlhalefo Metlhaleng (Email: tmetlhaleng@gmail.com; Cell: 0026772863115)

Instructions:

Please respond to items by ticking, where applicable, or providing responses in the space provided.

Section A: Biographical information

1. Which academic department are you a member of?	Tick
a. Agricultural Engineering and Land Planning (AEL)	
b. Agricultural Economics, Education and Extension (AEE)	
c. Animal Science and Production (ASP)	
d. Basic Sciences (BS)	
e. Crop Science and Production (CSP)	
f. Food Science and Technology (FST)	

2. How long have you been employed at BUAN as an academic?

a. 1 year or less	
b. 2-5 years	
c. 6-10 years	
d. 11-15 years	
e. More than 15 years	

3. What is your highest academic qualification?

4. Which age category are you in?

a. 30 years and under	
b. 31-40 years	
c. 41-50 years	
d. 51-60 years	
e. 61-65 years	
f. 66 and above	

5. What is your academic rank in the University?

a. Professor	
b. Associate Professor	
c. Research Fellow	
d. Senior Lecturer	
e. Lecturer	
f. Junior Lecturer	
g. Chief Technician	
h. Senior Technician	
i. Technician	
j. Other (please specify)	

6. How many of the following publications have you produced? (Indicate the number in the box)

a. Journal articles	
b. Books	
c. Book chapters	
d. Edited volumes	
e. Conference papers	
f. Project reports	
g. Other (please specify)	

7. How many of the following have you graduated? (Indicate the number in the box; use a zero to indicate none)

a. Masters students	
b. PhD Students	

Section B: Knowledge, skills and personal attributes

8. Are you aware of the institutional repository concept?

a. Yes	
b. No	

9. Do you know about the BUAN Institutional Repository?

a. Yes	
b. No	

10. If you responded 'Yes' to Question 9, how did you come know about BUAN's Institutional Repository?

11. Have you received any training on the BUAN Institutional Repository?

a. Yes	
b. No	

12. If you responded 'Yes' to Question 11, who provided the training?

a. BUAN Library repository staff	
b. Workshops run by the Botswana Libraries Consortium (BLC)	
c. Other (please specify)	

13. If you received training on institutional repositories, in what form was the training conducted?

a. Workshop	
b. One-on-one training	
c. Online virtual training with a facilitator	
d. Internet-based self-administered tutorial	
e. Other (please specify)	

14. If you responded 'Yes' to Question 11, what was the training about? (Indicate all that apply)

a. Repository awareness training (that is, the role of BUAN's Institutional Repository in promoting visibility and discoverability of the research output of the institution)	
b. How to ingest/deposit content (e.g. journal articles, conference papers, conference proceedings, theses & dissertations)	
c. Intellectual property issues (e.g. copyright, creative commons licensing, embargos)	
d. Funder policies/mandates on open access publishing of research output	
e. Other (please specify)	

15. Do you believe that you have the following knowledge (that is, what one should know or understand) to contribute to a successful institutional repository at BUAN? (Indicate all that apply)

a. Awareness of the role of BUAN's Institutional Repository in promoting visibility and discoverability of the research output of the institution	
b. Knowledge of intellectual property issues	
c. Understanding of the concept of open access (that is, free and full access to research output)	
d. Understanding funder policies/mandates on open access publishing of research output	
e. Other (please specify)	

16. Do you believe that you have the following skills (that is, what one is able to do) to contribute to a successful institutional repository at BUAN? (Indicate all that apply)

a. Creating a username and password to access BUAN's Institutional Repository	
b. Ingesting/depositing of content (e.g. journal articles, conference papers, conference proceedings, theses & dissertations) into the repository	
c. Negotiating copyright issues with publishers	
d. Updating submissions to the repository (e.g. replacing pre-print articles and work-in-progress with final published versions)	
e. Searching and discovering relevant content from the institutional repository	
f. Searching for copyright policies in databases such as *Sherpa-Romeo* or journal homepages	
g. Other (please specify)	

17. Do you believe that you have the following relevant personal attributes (that is, attitudes, values and personal traits) to contribute to a successful institutional repository at BUAN? (Indicate all that apply)

a. I feel strongly about the visibility and discoverability of BUAN's research output	
b. I should make myself available for necessary repository training for academics and researchers	
c. As an academic I should make the time to deposit and update submissions to BUAN's Institutional Repository	
d. I value the long term preservation of research output that BUAN's Institutional Repository offers	
e. I promote the use (depositing and searching) of BUAN's Institutional Repository among my academic colleagues and postgraduate students	
f. I have a social responsibility to openly share my research output (social justice obligation)	
g. Other (please specify)	

18. How significant a role do you believe personal attributes such as a positive attitude towards the role and functioning of the institutional repository on the part of academics and researchers, play in the planning and establishing of the repository at BUAN?

a. Of no significance	
b. Of some significance	
c. Of great significance	
Please elaborate on your choice of response	

19. Have you ever deposited content into BUAN's Institutional Repository?

a. Yes	
b. No	

20. If you responded 'Yes' to Question 19, what kind of content did you deposit? (Indicate all that apply)

a. Published journal articles	
b. Technical papers/reports	
c. Pre-prints (that is, manuscripts for journal publication but not yet peer reviewed)	
d. Post-prints (that is, drafts of journal articles after they has been peer reviewed but not the final published versions)	
e. Conference papers	
f. Conference proceedings	
g. Theses/Dissertations	
h. Project reports	
i. Book chapters	
j. Other (please specify)	

21. If you responded 'Yes' to Question 19, what motivated you to ingest/deposit into BUAN's Institutional Repository? (Indicate all that apply).

a. To increase visibility and discoverability of my research	
b. Potential for greater impact of my work in the research community	
c. I feel obliged to ingest/deposit my research output into this University facility	
d. For long term preservation of my scholarly output	
e. Other (please specify)	

22. If you responded 'No' to Question 19, what are your reasons for not ingesting/depositing into BUAN's Institutional Repository (indicate all that apply)

a. To date I have had no research output to ingest/deposit	
b. Fear of misuse of my work (e.g. plagiarism)	
c. Fear of copyright infringement on my part	
d. My view is that institutional repositories have low prestige among publishing platforms	
e. I have lack of knowledge and skills on how to ingest/deposit my content into the BUAN Institutional Repository	
f. I already have a platform where I archive my research output (e.g. my personal website)	
g. There is no peer review process in repository 'publishing'	
h. Ingesting/depositing into the repository is a further administrative burden for academics	
i. Other (please specify)	

Section C: Reinforcing the planning and establishing of an institutional repository at the BUAN Library

23. Do you believe that there are measures that may be put in place to reinforce the planning and establishing of the institutional repository at BUAN Library?

a. Yes	
b. No	
Please elaborate on your choice of response	

24. Do you foresee challenges for BUAN's Institutional Repository?

a. Yes	
b. No	
Please elaborate on your choice of response	

25. Do you foresee opportunities for BUAN's Institutional Repository?

a. Yes	
b. No	
Please elaborate on your choice of response	

Section D: General comments

26. Please feel free to make any general comments relating to the subject of this questionnaire.

End of questionnaire

Thank you for taking your time to respond to this questionnaire. You participation is much appreciated. If you have queries regarding the questionnaire do not hesitate to contact me at**:**

Tlhalefo Metlhaleng (Email: tmetlhaleng@gmail.com; Cell: 0026772863115)

Appendix D

Staff competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources

Semi-structured interview schedule for library repository staff

My name is Tlhalefo Metlhaleng. I am an MPhil (specialising in Digital Curation) student in the Library and Information Studies Centre at the University of Cape Town. I am carrying out a study on 'Staff competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources (BUAN)'. My study is being supervised by Associate Professor Jaya Raju. You have completed an informed consent form agreeing to participate in the study, and for this I would like to express my gratitude. You have also agreed/not agreed to this interview being audio recorded [place audio recorder on the table, if permission has been granted]. This interview should last not more than an hour.

Section A: Biographical information

1. What is your current job designation?
2. How long have you been employed in this position?
3. What is your role with regard to BUAN's Institutional Repository?
4. What are your academic qualifications (LIS and/or other)?

Section B: Knowledge, skills and personal attributes

5. What knowledge (that is, what one should know or understand) is required in planning and establishing institutional repositories?
6. What skills (that is, what one is able to do) are required in planning and establishing institutional repositories?
7. What personal attributes (that is, attitudes, values and personal traits) are required in planning and establishing institutional repositories?
8. Apart from repository staff, who are other relevant stakeholders in planning and establishing the BUAN Institutional Repository? [prompt: IT staff, academics]
9. What knowledge, skills and personal attributes should these stakeholders have for planning and establishing the BUAN Institutional Repository? [prompt: remind respondents to answer

in terms of the definitions of knowledge, skills and personal attributes, provided earlier; repeat definitions, if necessary]

10. Do you believe that the repository staff have the required knowledge (that is, what one should know or understand) for planning and establishing a successful repository? Please explain.
11. Do you believe that the repository staff have the required skills (that is, what one is able to do) for planning and establishing a successful repository? Please explain.
12. Do you believe that the repository staff have the required personal attributes (that is, attitudes, values and personal traits) for planning and establishing a successful repository? Please explain.
13. Do you believe that personal attributes such as a positive attitude towards the role and functioning of the institutional repository on the part of academics and researchers, play a significant role in the planning and establishing of the repository at BUAN? Please explain.

Section C: Reinforcing the planning and establishing of an institutional repository at the BUAN Library

14. What measures, do you believe, should be put in place to reinforce the planning and establishment of the institutional repository at the BUAN Library?
15. What challenges and opportunities do you foresee for the BUAN's Institutional Repository?

Section D: General comments

16. Please feel free to make any general comments relating to the subject of this interview.

[Thank the interviewee for participating in the interview, switch off the audio recorder and record the duration of the interview]

Appendix E

Staff competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources

Semi-structured interview schedule for information technology (IT) staff

My name is Tlhalefo Metlhaleng. I am an MPhil (specialising in Digital Curation) student in the Library and Information Studies Centre at the University of Cape Town. I am carrying out a study on 'Staff competencies in the planning and establishing of an institutional repository at the Botswana University of Agriculture and Natural Resources (BUAN)'. My study is being supervised by Associate Professor Jaya Raju. You have completed an informed consent form agreeing to participate in the study, and for this I would like to express my gratitude. You have also agreed/not agreed to this interview being audio recorded [place audio recorder on the table, if permission has been granted]. This interview should last not more than an hour.

Section A: Biographical information

1. What is your current job designation?
2. What is your role with regard to BUAN's Institutional Repository?
3. For how long have you been performing this role?
4. What is your highest IT qualification?

Section B: Knowledge, skills and personal attributes

5. Do you believe that the IT staff working with BUAN's Institutional Repository have the required knowledge (that is, what one should know or understand) for planning and establishing a successful repository? Please explain.
6. Do you believe that the IT staff working with BUAN's Institutional Repository have the required skills (that is, what one is able to do) for planning and establishing a successful repository? Please explain.
7. Do you believe that the IT staff working with BUAN's Institutional Repository have the required personal attributes (that is, attitudes, values and personal traits) for planning and establishing a successful repository? Please explain.

8. Would BUAN's Institutional Repository server be better managed located in the IT department, the Library or elsewhere (e.g. cloud-based)? Please explain.

Section C: **Reinforcing the planning and establishing of an institutional repository at the BUAN Library**

9. What IT measures specifically, do you believe, should be put in place to reinforce the planning and establishment of the institutional repository at the BUAN Library? [Prompt: What IT preservation strategies are being put in place for the BUAN Institutional Repository?]
10. What IT challenges and opportunities do you foresee for BUAN's Institutional Repository?

Section D: General comments

11. Please feel free to make any general comments relating to the subject of this interview.

[Thank the interviewee for participating in the interview, switch off the audio recorder and record the duration of the interview]