The Role the Consortium of Uganda University Libraries (CUUL) Can Play in the Implementation of Successful Institutional Repositories in its Member Institutions in the Central Region of Uganda

Naphtali Happy Kuteesa

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Supervisor:
Dr. Martie van Deventer

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DECLARATION

I, Naphtali Happy Kuteesa hereby declare that this mini-dissertation is a product of my own work and has never been submitted at any other university for the award of any degree.

Naphtali Happy Kuteesa

December 25, 2016

Supervisor……………………………………………………..

Signature……………………………………………………..

Date ……………………………………………………………

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DEDICATION

This work is dedicated to Mrs. Rachel Fischer; your professionalism inspired me always.

ABSTRACT

The Consortium of Uganda University Libraries' (CUUL) primary objective is to provide a forum for addressing issues that face Ugandan university libraries. Other objectives are: to standardise operations and promote the adoption of new library-related developments. One of these developments is establishing institutional repositories (IRs).

Institutions of higher learning worldwide embrace IRs as a way of disseminating institutional scholarly output at a globally. Ugandan institutions are not exceptional. However, despite the level of interest and the rate of adoption by university libraries in Uganda, only one institution and one research organisation in the Central Region of Uganda have managed to implement their IRs to meet Open Directory of Open Access Repositories' (OpenDOAR) standards.

The aim of this study was to investigate the role that CUUL could play in helping member institutions establish successful IRs that meet OpenDOAR standards. The objectives of the study included finding out what defines a successful IR project internationally, the state of IR implementation in the Central Region of Uganda and what CUUL could do to implement successful repositories in the member institutions in the Central Region of Uganda.

The study was qualitative, carried out in the central region of Uganda as a case study targeting CUUL member institutions. Respondents were purposively sampled, results were thematically analysed using spreadsheets and results presented in tables in chapter four. Conclusions and recommendations were made according to the findings.

It was revealed that most of the CUUL member institutions had embarked on the process of IR implementation developing them in-house without the necessary skilled technical personnel. Consequently, they had many challenges both technical and operational. Conclusively, many institutions had not successfully implemented IRs. CUUL could assist in the implementation of successful IRs by either offering Software as a Service (SaaS) or by assessing individual institutions and help each at their point of need. For any approach chosen, members were willing to actively work with CUUL to have better and successful IR services.

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List of Acronyms and Abbreviations

ARL SPEC	Association of Research Libraries, Systems and Procedures Exchange Center
ASSAf	Academy of Science of South Africa
CLIR	Council on Library and Information Resources
CUUL	Consortium of Uganda University Libraries
DATAD	Database of African Theses and Dissertations
DFG	German Research Foundation
DRIVER	Digital Repositories Infrastructure Vision for European Research
EIFL	Electronic Information For Libraries
FAO	Food and Agriculture Organization
ICT	Information and Communication Technology
ILS	Integrated Library System
INASP	International Network for the Availability of Scientific Publications
IR	Institutional Repository
IRs	Institutional Repositories
NITA-U	National Information Technology Authority of Uganda
NSF	National Science Foundation
OA	Open Access
OAI-PMH	Open Archive Initiative Protocol for Metadata Harvesting
OECD	Organization for Economic Co-operation and Development
Open DOAR	Open Directory of Open Access Repositories
OSTP	Office of Science and Technology Policy
PERI	Program for Enhancement of Research Information
RaaS	Repository as a Service
RENU	Research and Education Network for Uganda
RUFORUM	Regional Universities forum for Capacity Building in Agriculture
SaaS	Software as a Service
WHO	World Health Organization

CHAPTER 1: INTRODUCTION

All glory comes from daring to begin… (Eugene F. Ware)

1.1 Introduction

This chapter gives a brief overview of the background to the to the study, the central research question and sub-questions, the scope and limitation of the study, the rationale of the study, a brief overview of the literature, the research methodology, significance of the study, clarification of key terms and the structure of the dissertation.

1.2 Background to the to the study

The Research and Education Network for Uganda (RENU), collaborated with the National Information Technology Authority of Uganda (NITA-U) and laid fiber optic cables in all Universities in Uganda (Buwule 2014:93). This made access to the internet affordable to higher educational institutions. It also presented an opportunity to implement electronic systems such as Integrated Library Systems (ILS) and Institutional Repositories (IRs). Many institutions however, appear not to have improved their electronic systems despite access to faster affordable internet service.

The establishment of IRs is a fast-growing area of concern in information centers of academic institutions internationally (Liu and Zhou, 2011:589). IRs generally provide free / open access to valuable research outputs and historical materials. They are also useful promotional tools for universities worldwide (Bankier & Perciali 2008:23). Universities not only use IRs as one of the strategic initiatives in response to open-access in the scholarly world but they are also used as a central places / stores for scholarship history (Díaz et al. 2014:453; Moses & Stapelfeldt 2013).

Over the years, awareness has been created for institutions to consider the implementation of IRs (Barton and Waters, 2004:10). The UK house of commons' science and technology committee report of 2004 for example, recommended that all government funded research projects be made accessible via the UK's higher educational institutions' IRs (Picarra 2015:1), necessitating every institution to develop its own IR. In the academic world scholars produce information in the form of theses and dissertations as outcomes from most of their research activities (Ndor, 2013:12). This rich grey literature not only contributes to knowledge production in institutions but also suggests further areas of research in many disciplines of academia. Unfortunately, most of such produced information remains untapped - being stored

in university department resource centers. Establishing IRs for professional management, storage and provision of access to digital content appears therefore to be a necessity in higher institutions of learning.

This study sought to establish the answer (and an appropriate approach) to successful IR implementation in the Consortium of Uganda University Libraries (CUUL) member institutions situated in the Central region of Uganda. It is anticipated that other consortia in developing countries could use the study as a point of reference in establishing successfully IRs in their member institutions too.

1.3 Research Questions

Ugandan libraries formed CUUL with the purpose of helping members tackle common challenges. It was therefore obvious to expect that CUUL would be interested in ensuring that members implemented successful IRs. The study therefore sought to establish CUULs role in the implementation of successful IRs in member institutions.

1.3.1 Central research question

How could CUUL ensure the implementation of successful IRs that meet international standards in all its member institutions in the Central Region of Uganda?

1.3.2 Additional research questions

The central question, mentioned in 2.1 above, requires that additional supporting questions are also answered. The questions have been grouped into three focus areas each with several sub-questions.

I.   What does the international literature state as the requirements for successful IR projects?
   a.   What is the international description of IR success?
   b.   What factors contributed to success or failure of IRs?

II.   How viable is it for CUUL to get involved in the implementation of Successful IRs in the central region of Uganda?
   a.   What is the general state of IR implementation in the Central Region of Uganda?
   b.   Are institutions familiar with CUUL activities?
   c.   How involved are members in CUUL spearheaded projects?
   d.   Do institutions understand why CUUL projects succeed or fail?

III.   What can CUUL do to help member institutions implement successful repositories?

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a. What other contribution could CUUL make towards realizing successful IRs in member institutions?

b. What approaches could they use when getting involved with member institutions?

c. How could member institutions contribute towards successful implementation of IRs in other CUUL institutions?

1.4 Scope and limitation of research

The research was carried out in the Central Region of Uganda; focusing on the role CUUL could play to ensure successful implementation of IRs in all these member institutions. Although CUUL has three categories of members (i.e. public university libraries, private university libraries and affiliated institutions libraries), the study considered only university libraries. This was because results from university libraries could easily be generalized. The study was carried out between January 2016 and October 2016. The researcher interacted with selected IR managers and staff from CUUL member institutions from the Central Region of Uganda.

Although the recommendations were made based on findings from the Central Region of Uganda, the results could also be useful to other institutions.

1.5 Rationale for the study

As earlier quoted, higher education or post-secondary education's core purpose is research. Research can only be useful if published and used for its intended purpose or further research development. It is therefore prudent, in the current information age, to disseminate research in the most effective ways that meet the prevailing needs and trends of researchers or users. Institutional research and other publications require systematic management for effective access and utilization. Academic units across universities are overwhelmed with research reports, dissertations, theses, field reports and related scholarly works stacked in resource centers. These would contribute considerably to institutional output and visibility at global level. Institutions neither have more physical space for storage nor adequate management or retrieval systems and skills for manual systems. Establishing IR services would alleviate the challenge of storage space posed by print copies of these scholarly works. The rationale of the study was therefore to establish the approaches consortia could use to implement successful IRs of member institutions, which are at varying levels of IR implementation progress.

Inability to disseminate research output of CUUL member's research significantly disadvantages members' global visibility and international recognition. The study help establish IR challenges and possible solutions to them under consortia.

1.6 Overview of the literature

The study explored the concept of IRs and investigated the various approaches to the implementation of IRs. An IR service is seen as a set of services that a university offers to its community in the management and dissemination of digital materials created by the institution and its community members (Rockman & Bailey Jr, 2005:259; Lynch, 2003:328). African Universities hold rich, locally generated research results, capable of propelling national development but lack the means of presenting such research for access by the national and global scholarly communities and yet prevailing research policies still require researchers to submit print copies of their research and yet such copies are not easily accessible (Chen et al., 2013).

The study also investigated reasons why IRs succeed. Researchers such as Crow (2002), Lynch (2002) Gibbons (2004) wrote about IRs and some presented various indicators of success. Campbell-Meier (2011:153), identified the need for a comparative study of IR development but Westell (2006:213) and Cassella (2010:214) had already presented such comparative studies where success indicators were categorized into those related to (a) staff growth and training, (b) finances, (c) the internal process perspective and (d) user perspective. Shearer (2013:256) also provided reasons why IRs succeed and then discussed IR sustainability and promotion. Promotion strategies and sustainability practices are discussed in more detail in chapter 2. Both IR establishment and sustainability are very crucial steps in the successful implementation of an IR.

The study also acknowledged that establishing an institutional repository follows a given procedure as was explained by Barton and Waters (2004:11). This procedure is discussed in detail in section 2.5 of the next chapter.

The challenges associated with establishing an IR where discussed in detail in section 2.8 but some of these challenges are the following: low adoption rate by academics, lack of proper IR sustainability plans, policy challenges, intellectual property challenges, support, management costs, costly digital preservation processes and challenges with identification of the project team members - among others.

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Lastly, open access (OA) was explored as a means of increasing research visibility and CUUL, its members and its typical projects, was reviewed briefly in chapter 2.

1.7 Research methodology

This research is qualitative in nature. The research approach and the reasoning behind selecting a qualitative approach is discussed in detail in Chapter 3 of this report.

1.7.1 Target population

The target group (population) for this research was IR managers and staff in CUUL member institutions, of public and private university libraries category in the Central Region of Uganda. Because IRs are usually an initiative of libraries and they are managed by librarians or library members of staff, the researcher approached staff involved in setting up and operating university repository systems.

1.7.2 Sampling

Respondents were purposively sampled because the researcher was interested in respondents responsible for specific duties or knowledge related to the successful establishment and operation of IRs in Uganda. The sampling method is described in detail in section 3.7.

1.7.3 Data collection

The study employed the semi-structured interview method to collect research data. This data collection method was preferred because it "offers fast responses, allows asking more detailed questions, respondents' own words are recorded, ambiguities can be clarified and incomplete answers followed up easily" (Wahyuni 2012:73; Kombo & Tromp 2006:93). The method also allows the researcher to check the precise wording of the respondent's answers. The meaning of questions could be clarified if necessary and others in the group do not influence respondents' answers.

The interview sessions were used to establish the respondents' knowledge of IRs, their evaluation of their own IR progress, the content of the collection, challenges encountered with establishing and sustaining an IR service and reasons for the prevailing IR status. The researcher also interviewed respondents about their knowledge of CUUL, their perception of the effectiveness of implementation of CUUL spearheaded projects, how CUUL could get involved in establishing effective IRs and their recommendations to CUUL in regard to implementing successful IRs in all member institutions.

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1.7.4 Data analysis and interpretation

Interviews were transcribed and results were analyzed using spreadsheets (Microsoft Excel). Spreadsheets were used to organize and outline data summaries, and graphical representations derived where necessary. This together with a study of relevant literature formed the base for interpretation of findings and helped with developing logical conclusions.

1.8 Significance of the study

The study is valuable since it is meant to be used as a basis for establishing IR progress in CUUL member institutions. The author is of the opinion that an IR service is a missing link in the management of locally generated content in higher institutions of learning in Uganda. Without the transparency and retrievability associated with IRs the management of such valuable content is still manual, shelving reports in department resource centers making them inaccessible. An IR is important for University based researchers because their work could be preserved and shared if the repository if fully functional (Kakai 2009:7). This service will therefore enhance locally produced scholarly content management at institutional and international level.

The study also investigated and recommended ways consortia could get involved in the establishment of successful IR services in institutions. The research also briefly addresses the funding prospects towards IR project implementation. Funding is a major challenge in academic institutions especially in developing world (Teferra & Altbachl 2004:). Exploring an option for possible collaboration as an approach to establishing IR services in CUUL member institutions adds further value to this study.

1.9 Clarification of key terms

1.9.1 Institutional Repository

Several scholars have attempted to define an IR – each using a different focus upon which to base the definition. The IR definitions quoted most often is that of Crow, (2002) and Lynch (2003). Shoeb (2010:200) quotes Crow defining an IR as "a digital archive of the intellectual product created by the faculty, research staff, and students of an institution and accessible for end-users both within and outside of the institution with few, if any, barriers to access."

Lynch is quoted in the same article defining an IR as "a set of services that a university provides to the members of its community with the purpose of management and dissemination of digital materials created by the members of the university community." The service also includes

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safely keeping information material through long-term preservation, organizing it for easy retrieval using clear metadata terms, and facilitating distribution across the internet.

1.9.2 Consortium (CUUL as an example)

The Merriam-Webster dictionary defines a consortium as an agreement, combination or group of companies formed to undertake an enterprise beyond the resources of any one member (Marriam-Webster 2016). Common consortium work in collaboration to find solutions for their common challenges. Patel, Pettitt, & Wilson (2012:7) suggest that collaboration involves supporting each other with tools, networks, resources, team building, training, knowledge management, and error management. Bedwell et al. (2012:130) explains that collaborations could be done in different ways such as according to discipline. This study used consortium to mean an agreement to collaborate or put together efforts, or share all available acceptable resources for conjoint interest of collaborating parties.

CUUL is the Consortium of Uganda University Libraries formed with the purpose of facilitating effective and efficient collaboration and resource sharing among university and institutional libraries in Uganda in order to strengthen library services provided to patrons. CUUL has about eleven aims including but not limited to creating a forum in form of conferences, seminars and workshops where issues relating to information networking standards and trends would be deliberated. It also aims at service evaluation to member institutions.

1.10 Structure of the dissertation

The dissertation was sub-divided into five chapters: Chapter 1 introduces the study, the central research question and sub-questions. It covers the scope of the study and a brief to the research methodology including the target group for the study, the sampling and sample size, data collection, data analysis and interpretation. The chapter also includes value of the study, clarification of important concepts and a brief discussion on the division of the chapters.

Chapter 2 consists of a detailed review of the literature. Major themes about IRs have been addressed such as indicators of success, challenges faced by IRs and options for establishing an IR service.

Chapter 3 covers the methodology that was used to conduct the study. It entails the study type, the population, data collection method, the sampling techniques used and sample size. It also covers how data was analyze to reach deductions made in chapter four.

Chapter 4 comprises results from the empirical study. Data in textual and graphical form is used to present the results, analyses and meaning. Answers to sub-research questions are presented in this chapter based on answers from the empirical study.

Chapter 5 comprises conclusions and recommendations of the study. Based on the outcomes of the study, recommendations were then suggested.

1.11 In Summary

The chapter has given an introduction and overview of the study; the meaning of IRs, what they can do to institutional scholarly output and the challenges that IRs face. The chapter gave the research scope, research value, how it is organized and timelines within which it the study was carried out.

The study focused on three major questions:

1. How do institutions describe their IR implementation progress?
2. How viable is it for CUUL to get involved in the implementation of successful IRs in the central region of Uganda?
3. What can CUUL do to help member institutions implement successful repositories?

The next chapters explain how these questions were answered and the methods used to arrive at the answers and recommendations.

CHAPTER 2: LITERATURE REVIEW

"Green OA self-archiving is not a substitute for peer-reviewed subscription journal publishing: it is a supplement to it, for the purpose of providing access to all users, rather than just to subscribers…"(anonymous)

2.1 Introduction

This chapter reviews literature relevant to the study. Themes such as Open Access (2.2), the concept of IRs in a university context (see 2.3), the need for an institutional repository (2.4), options when establishing an IR (2.5), reasons for achieving IRs success (2.6), indicators for IRs success (2.7), and Common IR challenges and reasons for not achieving success (see 2.8). The chapter further explores concerted effort in IR establishment (see 2.9) and the Consortium of Uganda University Libraries (CUUL) with its typical projects (see 2.10).

The introduction of IRs gave a new perspective to the management of information in this age where the Internet rules communication (Bhardwaj 2014:185). IRs are instrumental in the production, dissemination and use of locally produced e-resources at a rate only comparable to electronic journals. The researcher intends to learn about factors that make IRs successful or make them fail as well as challenges encountered during IR establishment. The intension is to collect the necessary lessons for establishment of an IR in an academic institution. Such information shall be useful to CUUL for the establishment of IRs in member institutions found in the Central Region of Uganda. Institutions worldwide now appreciate IRs as tools for research dissemination, scholarly communication and publishing (Chan 2004:277; Swan & Chan 2009), given the large proportions of academic records produced in electronic format. Although that seems to be the trend, many institutions in Uganda have not wholly embraced the use of IRs for various reasons.

Uganda's university libraries in their discretion formed a consortium to provide a platform where some of the common challenges could be tackled and handled. Major projects have been successfully accomplished through the consortium including open access advocacy, knowledge sharing and sustainable scholarly communication, electronic resources access and capacity building. Scholarly communication and research being some of the major aims for which universities exist, it necessitates that the consortium considers instituting means of research dissemination in all her member institutions as a way of directly promoting one of the major institutional goals.

Several factors cause libraries to struggle when implementing and sustaining major ICT projects such as IRs on their own. Many libraries in Uganda for example, have no integrated library systems or IRs; and those with them, are struggling to sustain them.

2.2 Open Access

Royster (2012) explains that the concept of open access (OA) includes two schools of thought: the notion of *Gratis* OA for those who perceive OA as free to access, use and store without purchasing, incurring any fees or registering. The second school of thought, *Libre* OA agrees with Grantis OA's definition and adds issues like the freedom to re-use, modify, re-distribute, re-package, make derivative works and all other alterations that a user may wish to do with the work. The author would thus retain the copyrights but would grant a creative commons license that permits all other uses subject only to acknowledgement as a requirement. The creative commons license usually emphasizes three conditions: BY-must credit original authors, NC-non-commercial use only and SA-share alike meaning subsequent re-use must apply same creative commons licenses.

However, Suber (2015) simply defines OA as "electronic content, online, free to access, free of charge and free of most copyright or licensing restrictions to information". . OA involves unrestricted use or freely availing scholarly research literature to all. OA transcends lifting a few barriers that would rather pass as fair use. The Budapest Open Access initiative, one of the major advocacy initiatives of OA, explains that OA means freely availing content on the public Internet and, sanctioning any users to read, copy, download, print, distribute, index, link, critique, or use information for any legitimate purpose, without any financial, technical or legal barriers, where Internet is accessible (Chan et al. 2002). The only requirement is intellectual honesty, where due credit to the authors is given by acknowledging their work through citations.

Note should be taken that OA does not imply universal access, even when OA is fully operationalized. Suber (2015) cites four barriers that make a difference between OA and universal access. The first is *filtering and censorship*, where agencies like schools, employers and governments limit information to be accessed. The second is *language barriers* where one is limited to knowing as much as they can read and understand in a given language. There is also the *handicap barrier* where online resources may not be accessible to handicapped users; and the *connectivity barrier* where the digital divide keeps a huge population off-line. Despite

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the barriers, the OA campaign cannot be held off because eliminating price and permission barriers is a significant drive worth pursuing.

2.2.1 Open access and IRs

Important to note are some of the terminologies used in expressing ways of information access. (Suber 2012:6) explains that where work is not freely accessible then it is called *Toll Access*. Toll access, sometimes referred to as conventional publishing, is the usual approach where publishers demand money before giving access to literature. OA publishing, on the other hand, has two main forms known as Gold and Green OA.

Gold OA is where OA is delivered through journals: and *Green OA* is where OA is delivered through repositories. Due to OA advocacy, some academic publishers have had to adjust greatly to an extent that some publishers are even born OA. A number of outstanding publishers have adapted to OA fully while others partially allow authors to self-archive their work with OA repositories. Others may require publisher's permission especially where authors have transferred their copyright to publishers. Nevertheless, it should be noted that OA was not born to outcompete commercial publishing.

OA initially targeted publicly funded research with exception of classified military research, research resulting into patentable discoveries and research published in some form of royalty products like books (Suber 2015). Because most donor funded research in developing countries comes with implications on the nature of research (Teferra & Altbachl 2004:28), most academic researchers often opt for self-funding of their research. Such researchers aim at publishing their research for commercial value. Such research is usually published with academic publishers who undertake the task to proofread and edit, produce and market the resource. A move to promote OA in such situations will attract resistance not only from the academic publishers but also financially benefiting authors.

A closer analysis of the toll access reveals that the scholarly community ridiculously loses with toll access in the way that authors or researchers from the academic world who publish with commercial agencies, undergo the gruesome process of research. Even after such a gruesome process, they make articles, publish them in commercial journals, earn small royalties, yet their institutions subscribe expensively to the same material from commercial publishers. There is no justification for exaggerating the access costs of published journal articles. Although academics pride in publishing in commercial high impact journals for viewership, they stand

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to miss out because very few institutions can afford to consistently subscribe to them. The drive to publish with high impact journals has always been citation and impact factor for professional development. On the other hand, OA repositories offer open access by default to all their content (Suber 2012), which attracts bigger viewership and citation. Repositories can also accept "darker deposits" which become open access after their embargo time expires. The purpose of the OA campaign therefore, should not be misconstrued as destructive to commercial or non-open access publishing businesses or journals. It is a constructive campaign aiming at reaching a larger body of literature to a larger community. That is why IRs have been developed with some degree of interoperability, with ability to expose metadata records and content in a standard way for harvest by external processes (Paul Walk 2015). This is done using standard protocols OAI-PMH and other metadata profiles like OpenAIRE. This makes IRs powerful tools to relay information over search engines for retrieval and access. The major advantage with them is they are openly accessed and information can easily be accessed by all.

An OA IR can be organized by discipline or other administrative arrangements of an institution such as schools, faculties or departments as IR communities. Organizing the collection by similarity increases accessibility to content and is a step towards standardizing an IR for quality output. Although IRs do not perform peer review themselves, they host articles peer-reviewed elsewhere such as post-prints and preprints. Quality of other publications such as dissertations and theses can locally be reviewed by the research committee before being posted in an IR. Other content like local conference proceedings, course materials, departmental databases, institutional records and digitized content can be selected for inclusion if their quality meets set IR standards.

When setting up an open access IR, it is important to implement open access policies too. Lovett & Rathemacher (2014:23) suggest that there are permissions-based OA where authors allow a given degree of access to their work / outputs. Access policies with IRs include copyrights and other access licenses such as the creative commons license. The other policy items include mode of submission, acceptable IR collections, preservation policies and others. With the open access policy, a key component is a no-questions-asked waiver, which allows a researcher/author to opt out of the OA requirement for a particular article for any reason or even to delay access for a given period. This preserves the academic freedom of the authors, making it palatable for the faculty/authors/researchers for likely acceptance and collaboration.

2.2.2 Open Access verses commercial publishing's impact factor

Although journals are gold and toll access, debates have always got IRs involved especially about the impact factor. When Eugene Garfield first introduced the idea of journal impact in 1955, he had no idea it would become controversial (Garfield 2005:1). Debates about impact factor have raged the academic world leading to other terms such as **research impact**-demonstrable contribution that research makes to society or economy (Antelman 2004:372) and citation counts vis-à-vis citation impact factor (Harnad & Brody 2004). The whole fuss is about publishing research, its accessibility and trust for usefulness to the community. There is usually a perception that open access journals are substandard and their research quality low, however, the Academy of Science of South Africa (ASSAf) working with DATAD have ensured trustworthiness in their OA journals. IRs on the other hand ensure their trustworthiness by adhering to standards set by the Directory of Open Access Repositories (Veldsman 2016). These may not be achievable in a short span but with dedicated careful processes, achievable. About the impact factor, across years, it is clear that open access journals have high personal citation impact compared with commercial journals (Harnad & Brody 2004). It is not a guarantee that publishing with a high impact journal will make an author's article cited. In their study, Björk et al. (2012)establish that OA journals are doing better in sampled scientific disciplines and that gold OA is rapidly picking and gaining high impact in the overall volume of peer-reviewed journals and trusted IRs.

Sometimes authors are concerned about measuring the use of their articles in an IR. According to Swan & Chan (2009:1), software is available to measure usage of IR services by recording the downloads, views and visits to each item. These are harvested in a database that can be requested by any author. This evidence therefore, presents a strong case to encourage authors to adopt publishing with OA initiatives for research impact and personal citation count.

2.2.3 Increasing research visibility with OA IRs

The 2003 Berlin declaration by leading research organizations on reuse of research data, which also saw the birth of the "Open Access to Knowledge in Sciences and Humanities" campaign and the relevance of research as an integral part in the scholarly knowledge (Pampel et al., 2013:1), advises individual organizations to search for ways to address research visibility. Several organizations such as the Organization for Economic Co-operation and Development (OECD), Royal Society, European Commission (Pampel et al., 2013:1) and many others have joined in, coming up with dossiers, methods and ways of research results dissemination. It

makes sense that individual institutions manage their own research visibility. However, Shearer (2003:254) argues that few would deny that federation of IRs comprising scholarly output of a bigger quantity of research institutions is worthy trying. A federated IR has higher possibilities of getting research output visible compared to individual IR services.

Where research funding organizations such as The Office of Science and Technology Policy (OSTP) of the USA, (Office of Science and Technology Policy, 2013:3), The National Science Foundation (NSF) (National Science Foundation, 2011), the German Research Foundation (DFG) and the Nature Publishing Group, have adopted research data reuse policies (Nature Publishing Group, 2013). This necessitates that research data for funded research by these organizations is accessed by all. Effective reuse can be if it is stored in a federated IR. More still, Consortia are more likely to effect this than would individual institutions especially in developing world marred with gross corruption.

2.3 The Concept of IRs in the University Context

A university-based IR service as clearly defined by Lynch, consists of a set of services that a university offers to its community in management and dissemination of digital materials created by the institution and its community members (Lynch, 2003:328; Nazim & Mukherjee 2011:4; Bhardwaj 2014:186). University based IRs hold a diversity of digital materials such as preprints (research journal articles before publishing), post prints (research journal articles after publishing), technical reports, theses and dissertations, data sets, and teaching materials, preserved for long term storage and access (Nazim & Mukherjee 2011:4). Some institutional repositories are also being used as electronic presses, publishing e-books and e-journals (O'Doherty 2009), although this is not one of the major functions of an IR. The governing principle is IRs preserve digital collections that hold the intellectual output of a single or multi-campus institution or community (Shearer, 2013:250).

An IR service can be managed by a single institution or under a multi-university community (Shearer, 2013:250). According to Swan's (2008:11) topology for business models for digital repositories, institutions collaborating under a given arrangement such as consortia can implement an IR service in what he referred to as the ***community model***. This gives a leeway to institutions who wish to implement repositories under consortia that unifies them with a given purpose. Libraries should cultivate a mixed method approach to providing access to digital content (Garrison 2013:291). There is need to diversify approaches to common challenges of institutions identifiable with a common characteristic.

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According to Suleman (2007:8), IRs in the university context can be departmental, special collection, centralized, departmental federated and university federated. Departmental repositories house a single department collection; special collection IRs collect rare collections of an institution; while centralized IRs accommodate all material from the whole institution which can be classified into communities depending on the institutional arrangement. Federated departmental or university IRs are the kind that combine departmental or university IRs but still retain their semi-autonomous status. A consortium can federate members' IRs using the Open Archive Initiative Protocol for Metadata Harvesting (OAI-PMH) or OAIster (combined bibliographic catalogue for open access material accumulated by OAI-PMH) with the purpose of increasing IRs content visibility with Google and other search engines (Lynch & Lippincott 2005). Federated departmental repositories are done in a situation where an institution has several successful departmental repositories that are semi-autonomous, but require more support for better visibility. However, federating IRs can be even at consortium level, where IRs are at the same success level.

An IR service is an initiative intended to manage digital objects for effective utilization (Bhardwaj 2014:186). Depending on the need, an institution may set up specialized IRs to handle specific types of content (Mukhlesur & Mezbah-ul-Islam 2014:48). Most universities will have electronic dissertations and theses IR different from other repositories that hold conference presentations, teaching material, research data, preprints, data sets and others. This will depend mostly on available resources. Institutions that are highly involved in research will have enough collection made of students' dissertations and theses making their own IR with diversity of coverage. Dissertations and theses can also just be a community in the general IR collection where resources are limited to classify them by subject handled. Dissertations and theses are not the only unique independent IR in a university setting. Some universities have been established following an interesting history that has been captured in graphic form. Such history can also be relating to the community where they are setup. An IR capturing such historical events is another unique repository universities can think of. Where a substantial collection exists with good metadata, an independent IR can be made otherwise even making a community of historical events in a major IR would still be appropriate.

2.4 The need for an IR

With the increase in the use of ICTs coupled with available open source software packages, institutions develop and maintain IRs with the objective of collecting, preserving and

disseminating intellectual content of an institution (Nazim & Mukherjee 2011:4; Mukhlesur & Mezbah-ul-Islam 2014:48). Information follows a life cycle from conceiving an idea and adding information on it, to storage of information and making it available for access for development of other ideas (Runardotter et al. 2006:22). When information produced for an audience does not get to its intended users, it becomes useless. IRs play a certain role of disseminating scholarly research for access and further research development. IRs are openly accessed and institutions that have established IRs claim it as a major milestone towards the open access movement.

Another key role of IR is to support communities where knowledge is created and shared in a trusted environment, accommodate interdisciplinary research in interdisciplinary communities, long-term preservation, make research visible and promote impactful usage nationally and also internationally (White 2009:2). Both the scholarly and the popularity impact of IRs content can be ascertained using almetrics. Further, download counts, page views, bookmarking metrics, visitors, search terms and social media activity metrics contribute to impact assessment. These can be trusted by faculty review committees to appraise an author's work for promotion (Konkiel & Scherer 2013:22).

Just like Clarke et al. (2013) put it, a gap exists between research-generated knowledge and the utilization of that knowledge in the real-world practice, such is the situation with academic research in many African universities. African Universities hold rich locally generated research content capable of propelling national development but lack the means of disseminating such research for visibility to individuals in decision-making positions. National and global scholarly communities need academic research for further research development too. At the fore front of this challenge are disabling factors such as unfavorable research policies where, for example, researchers submit hard copies of their research as a requirement, which makes access more difficult (Chen et al., 2013). Research is only useful if applied to solve prevailing problems. Establishing repository services appears to offer some answers to dissemination and access to research done at universities for global visibility. It is through global visibility that healthy comparisons with other institutions is gained, adoption of better operational standards is emphasized and a possibility of international collaborations opened (Goodier 2014). Some scholars have argued that dismal performance of some universities is regional. In their research about web visibility of Universities, Lee & Woo (2012:208) confirm there is a difference in the level of visibility of universities by region. This was not to mean that certain areas are not visible, but comparing the rate of access to the links visits and hits generally. The more a region

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is known for its research production, the higher the chances of a university in that region of being visible. For example, Kyambogo University is known in Uganda for training people who work with persons with special needs. No one who would wish to research about special needs training in Uganda can ignore Kyambogo University as a potential source of information. This however can be achieved where publications on such a subject are compared to others in the region such as sub-Saharan Africa.

The introduction of IRs was not only redefining production, dissemination and global visibility of the institution's output, but also challenges the unsustainable costs of traditional publishing in high impact journals (Bhardwaj & Kaushik 2013:53). In their research about the cost of production of a high quality digital monograph in over 20 American university presses on 382 titles, Maron et al. (2016) discovered that the cost was averaging between thirty thousand ($30,091) and forty thousand dollars($49,155). The average cost of producing a single article in a journal in America in 2011 was between three thousand five hundred ($3,500) and four thousand ($4,000) dollars. Despite the fact that peer reviewing of scientific research is free for most of the articles published in journals, the cost of publishing is that expensive. Access itself is also expensive; raising concerns from authors about the value publishers really add to their work to deserve overwhelming amounts paid to them (Noorden 2013:426). Some scholars argue that the cost is justified by the essential hierarchy of scholarly journals, institutionalized to have an impact measure based on to rank journal's performance and prestige (Solomon & BjörK 2012:2: Noorden 2013:429). With IRs, such costs are avoided yet good quality work is produced and peer reviewed at least costs; favoring many who intend to publish.

IRs offer a standard centralized storage to institutional information output both published and unpublished (Jain et al. 2009:3). The process of research leads to production of more information. Part of such information includes research data, progress reports, proposals and finished research reports. This kind of information requires a central storage facility where it can be tracked (Erway 2013:8). Research funding organizations often demand that much of the research data be made available. This therefore, dictates that the research compliance officer stores sponsored research findings and metadata into a central storage for easy access and dissemination. IR offer a convenient storage option in this case. Not only do IRs offer a centralized storage but also a standardized storage (Jones et al. 2006:22) using a qualified metadata schema such as the Dublin Core metadata schema. Standardized storage promotes interoperability and discoverability of content.

2.5 Options when establishing an IR

Barton & Waters (2004:11) suggest that when establishing an IR service the following nine stages are essential;-

a) Learning about the process through reading and probing other institutional repositories.

b) Defining the service and developing a service plan. Identifying and assembling an IR team responsible for planning, implementing and running the service. Staff will be needed to conduct needs assessment, resource assessment like developing list of requirements or identifying gaps in performance.

c) Assembling a team to do the work.

d) Choosing the technology to be used and installing the software platform on the servers. The choice of a technology used should be in position to meet the needs of the users.

e) Marketing the service campus wide to both staff and students.

f) Launching a service.

g) Running/ maintaining a service.

h) Appraising the system.

Each of these is described in detail below:

2.5.1 Learning about the IR development process

The implementation team takes some time studying and understanding the concept of IR service. The stage includes understanding what an institutional repository entails, reviewing the different approaches on how other institutions develop their IRs, understating the IR mission or goals and the position of an IR within a wider information environment of the institution (Repositories Support Project 2016). Learning about the IR process also involves learning about why and how people use institutional repositories (Barton & Waters 2004:14). The behavior of users dictates the nature of the IR to be developed and the nature of content to be housed in that repository.

2.5.2 Service plan and definition

IR service definition precisely means outlining what an institutional repository will offer. Service definition and plan is fundamental in the IR service development because it is where the anticipated content format and types such as academic research, students' theses, learning material, university records, staff theses for higher degrees, conference presentations, and institutional/community historical pictorial, to comprise the IR content are decided. Under the IR service plan, decisions of who deposits content, who approves, who is responsible for metadata entry, the service mission, key users, key stakeholders, the service priorities, fees for service if any and division of responsibilities between the library and the rest of the content community (Barton & Waters 2004:16) are suggested.

A service plan is developed through conducting a needs assessment in the institution, developing a model according to the plan, developing a schedule of major events and developing policies that will guide content acquisition, distribution, retention, disposal and appraisal. It is important that decisions on major issues about an IR be taken early since they greatly influence technical and other infrastructural decisions.

2.5.3 Assembling a team

The IR implementation process involves a number of tasks including conducting needs assessment surveys, resources assessment, synthesizing results of surveys and developing presentations to staff, potential funders and academicians (Barton & Waters 2004:20). With such a diversity of roles, an IR planning and implementation team would then constitute personnel knowledgeable in budgeting, IR technical knowledge, administration, archiving, marketing and promotions.

They carry out a needs and resources assessment in form of surveys, from which a service model is developed and the cost for the IR implementation project established, including all equipment needed. The implementation team assists with setting up communities, supports users, reviews metadata, creates metadata, manages collections and consults with other stakeholders on any user support services required. The dynamic skills of the personnel that make up the IR implementation team determine the IR's successes or failure.

2.5.4 Choosing the technology

The institutional approach to setting up IR services was found to involve any one of three following ways: by use of *off-the-shelf (commercial software), software as a service (cloud*

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hosted/collaboration) and *in-house development.* Using off-the-shelf software or outsourcing the development process depends on the availability of service providers and affordability. It may involve bidding or off-the-shelf purchase from vending organizations. In Uganda, there are not many registered companies involved in IR development, customization or installations. Basing on a preliminary survey, the researcher noted that there was no common commercial software used for repositories by any institution in Uganda. DSpace, an open source software was the most commonly used software platform in university institutions. Software as a Service (SaaS) involves cloud hosting of the IR with a vending company. It involves teaming up with other institutions in an organized arrangement and hiring services of expert companies specialized in hosting organizational information online. Individual accounts for member institutions are created and managed remotely by the institution. There were also no SaaS companies involved with IRs currently in Uganda. In-house IR development was the most common approach in Ugandan institutions. It normally used open source software such as DSpace, Greenstone, Eprints and Fedora. In-house development in Uganda involved assembling of an IR team that works with an IR installation and customizing expert, to practically install, customize and set up an IR in training sessions.

2.5.5 IR marketing and promotion

All may be done right with IR implementation but fail at marketing. In promoting and marketing IR it is critical to begin with communicating to stakeholders in the university about how the service would benefit the university, how it fits into the university's overall academic plan and its utmost contribution to the institution's performance on the global platform. This aims at increasing adoption of the IR service. Promotion and Marketing can be done by developing a marketing and promotional plan, which among others, includes value added services for users (like commentary), engaging the community by developing and encouraging a self-archiving policy and deposit incentives (Ferreira et al. 2008).

While carrying out promotions, it is important that the team identifies potential early adopters from the opinion leaders in the academics, administration, institutional public relations team, external audience (convocation and alumni) and academic advisory groups and sell the idea of how an IR works first alongside other groups. These can spread the IR philosophy to others.

The marketing approach should be Top-Down, Bottom-Up and Peer to Peer. The Top-Down approach involves marketing the service from the top institutional officials downwards through the ranks. It is more effective where high ranking members of the IR team engage with the high

ranking officials of the institution as peers. The Bottom-Up approach targets service of academicians, staff communities, technical staff publications communities and other, with the purpose of demonstrating how an IR is useful to them in their various communities and the institution at large. It is pyramidal, starting with pitching the majority of the staff at lower ranks to the fewer staff in top ranks. The Peer to Peer promotion aims at enhancing client-centered service (Jacobson et al. 2012:2) as a way of expanding awareness from one person to another with people they are comfortable with. Staff may promote the IR to fellow staff, while researchers do so to fellow researchers. It is a promotion of service to and by the people in the same ranks.

The importance of promotion is to sensitize the public about IRs as another avenue where information resources can be deposited or retrieved (Dorner & Revell 2012:264), to get potential contributors to the IR collection, train and assist contributors on how to submit their research, demystify the norm that IRs promote themselves if they have good content through search engines. One easy way of promoting a resource in an IR is using valued-added services and add-ins such as the comments section. Comments if used well, generate ideas, create insight and act as a "review" for the published document. Useful statistics such as total of deposited items per author, user statistics or number of full-text downloads, location of visitors or users who download an item, the request a copy add-in, controlled vocabulary, web of communication add-ins (Ferreira et al. 2008) draw users and their opinions which promotes an IR service.

The above withstanding, marketing and promotion can take all approaches including face-to-face meetings, press releases, using the PRO office of the institution, using printed brochures, posters, adverts on institutional websites, planned promotional events (targeting potential IR communities), library staff and other IR staff training sessions, as well as using branded gifts like card holders and others. These various approaches would make awareness an important component of promotion needed to sensitize the community about the service.

2.5.6 Launching and Running the IR service

Launching an IR should be a publicizing event. In places like the USA, it is a fundraising event, where potential donors, researchers and academics are taken through the IR mission and its impact on the overall academic life of depositors. Content communities, IR policies, IR team are publicized and the funding for pilot projects declared. Although it is hard to implement and replicate in many countries, an effort to reach out to the academics and university policy makers

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is useful in many ways. The team at this phase can aim at showing the academics what IRs can do for their h-Index scores or the frequency of use of their articles in terms of downloads. Academics are interested in establishing users of their resources both within the institution and out of the institution, this assures authors of wide access to IR collection (Armstrong 2014:43), long term preservation and storage. This should accompany an assurance for regular approvals of submitted work and proofreading of metadata.

For any success with running an IR service there is need for teamwork since a diversity of skills are needed, time, commitment, clearly set goals (both short term and long term), creativity, perfection, periodical reflection on the successes (milestones) and project champions (Piorun et al. 2007:156) are vital ingredients in the team. These principles compliment factors that influence the success or failure of an IR discussed in the next subtopic. Running an IR service rests upon the team convincing authors to deposit their work with the IR (Ferreira et al. 2008). It can be made a policy issue to deposit all journal articles and all university sponsored research with the IR, but that goes along with good marketing of the IR team.

2.5.7 *Running/ Maintaining an IR Service*

Running an IRs is a full time job that occupies the IR manager or staff all year round. The service is an engaging one with quite a number of activities to handle on a daily basis. There is need to develop policies in the first place, which govern the IR service, endorsed by the organization management. According to Swan (2008:21) repositories that operate without any formal endorsement of their policies from the organization often struggle. All repository business is contained in the repository policy such as the requirements of the authors to the repository, and the repository content. The policy document contains the IR vision, mission, and objectives, proposes staffing requirements, technical requirements, upload and submission procedures for users, promotions, marketing and assessment strategies and recommends necessary professional training (Nagra 2012:141-149). Issues of copyright for authors are also addressed in the IR policy document. Evidence is available that IRs without a firm IR policy remain virtually empty, while those with policies are filled more effectively (Swan 2008:23).

Running the service involves populating the repository using acceptable means. This includes getting authors deposit their research with the IR (self-archiving), digitizing print content and storing it in the IR using easy-to-understand content titles (such as dissertation, published article, poster, conference presentation, books, book chapter, post print or preprint, working papers, data sets and others) for all communities. On a daily basis, the IR team approve these

deposits, reorganize metadata, create and monitor user accounts for adherence to rules. The team ensures that links are operational and service accessible all the time. Although the IR may be free to submit content, staff members ought to oversee submitted content to ensure proper submission and balance in the collection.

Attending to user needs such as downloading articles, help with searching content, collecting user statistics especially capturing the rate of download of IR content, training depositors, library staff and technical assistance with IR access or any user needs comprise running the repository. There is also need to trace user interests in the collection (Garrison 2013:296) exhibited in the user statistics. Basing on such statistics, the team recommends adoption of different policies with the hope of ensuring proper use and sustainability of the service.

Running and maintaining a repository cannot be sustained unless there is a budget to it. Sterman (2014:367) classified the budgets into startup budget and the operational budget. The startup budget comprises costs related to purchase and funding items needed at the start of the service such as the storage equipment like servers, cloud-based storage costs or external storage. Depending on the approach used, costs in training or hiring of expatriates, installation and customization of the software require substantial sums, which also consist of the startup budget. Unlike the startup budget, the operational budget comprises recurring costs involved in the running of the repository. These include training costs, costs of hosting the repository site, costs related to remuneration and bonuses of workers, costs related to depositing and metadata preparation, cost of appraising and monitoring system effectiveness and the like.

2.5.8 Appraise the system

It is common knowledge that new technology is developed every minute. New systems, software, programs and updates are developed every day to improve system efficiency, effectiveness and performance. The overall purpose of IR appraisals is to get the systems to run with the prevailing technological standards, to check system flaws and assess the system usefulness in relation to the prior set goals and objectives.

It is important to assess the system's impact to the scholarly life of the institution, the institutional visibility as a result of the IR, but also the influence it has on the working life of the librarians and other IR staff. In their open scholarship assessment article, Bothma, Pienaar and Hammes contend that the creation of the digital repositories has had a huge impact on the working lives of information scientists for example, many adapting to new roles such as

digitization specialists, collection managers, metadata specialists (Bothma , Pienaar & Hammes, 2008:280) which were non-existent before. Such evidence can be revealed where an IR is appraised.

RaaS meets most would be objectives of consortia or organizations in establishing IRs. According to Sterman (2014:362), institutions would want interoperability and visibility. To be truly interoperable, repositories require more than just comparable metadata, but a reliable link between them and search engines. Arlitsch & O'Brien (2012:72) argue that IRs should use specific metadata to every entry, in order to be easily found through basic searches. This can easily be done under RaaS because users have more time to properly index entries compared with where institutions are using try and error approaches. On the side of visibility, RaaS brings together a host of institutions under one service but with semi-autonomous authority such as ability to manipulate metadata. Communities in other IRs under RaaS can be easily accessed. Specialized collections and institutions with special communities of research can easily be accessed with simple searches.

Another objective is engagement and dissemination. Just like the SPARC IR checklist and resource guide states, IRs offer strategic and immediate responses to systemic challenges in journal systems offering long term benefits (Sterman 2014:362). Imagine a federated repository of over 30 research institutions, each with their unique collection, in various disciplines working together under RaaS. Although it may not equate the journal service at the start, but surely provides a considerable amount of engagement between federating institutions which would result in more collaborative authorship encounters and wider access to IR published articles. This not only increases engagement of researchers and dissemination of research but also increases researcher voluntary participation.

 Funding of academic institution activities the world over, has been steadily reducing since the start of the 21st century, up to crisis level especially in Africa (Teferra & Altbachl 2004:26). Institutions can only survive if they create more affordable means to manage the crisis. Using RaaS under consortia would help institutions manage technical, financial and managerial issues that adversely affect IR implementation in many institutions.

2.6 Reasons for achieving IRs success

Project management literature suggests two components of project success: project success factors that refer to elements of the project that can be influenced to increase chances of the

project being successful and project success criteria which refers to the measures by which we judge the successful outcomes of a project (Müller & Turner 2007:299). Success of an IR project has been discussed below presenting both the IR project success factors and project success criteria. The researcher is cognizant of the fact that an IR project success varies according to the importance attached to the success criteria. However, every successful project begins with understanding its significance. When the significance of an IR is not understood, the value of its services may be underestimated and, consequently, organizational support to ensure IR survival and growth may dwindle (Lagzian et al. 2015:147). If an institution seeks to develop and grow an IR for posterity that will positively influence the community, it is paramount that it addresses the factors that influence the success of IRs. The repository team needs to address the conditions needed to implement and operate an IR successfully.

Westell (2006) identified eight factors that influence IR success, of which six are internal including (1) IR mandate, (2) integration with planning, (3) the model of funding, (4) measurement, (5) promotion and (6) preservation strategy. The two external factors include (7) interoperability and (8) relationship with digitization centers. A brief explanation of each is presented below:

(1) A *clearly defined mandate* of an IR where the nature of a repository is specific (whether subject specific, mandated, multipurpose, format specific or faculty-centered), priorities defined and content clearly outlined is key to its success (Westell 2006:213). This is important for effective IR populating and getting a clear vision of the repository from the onset.

(2) Having the *goals of an IR aligned with the institutional academic plans* and a plan for sustainable funding from the development stage through the implementation and appraisal stages suggest IR success. An IR project can only succeed if it helps fulfill one of the institutional goals. Using accountability structures that outline institutional goals and objectives, the IR team can assess and align it to goals such as those related to research and scholarship, as a means to disseminate research output and research funding, since IR goals are often consistent with most research funding agencies. The IR team has a task to advocate and promote the role of an IR in the scholarly world so that stakeholders change their perception (Yakel et al. 2008) towards the IR, beginning with the librarians. The team has a task of confronting traditional scholarly publishing convincing the authors about how they can present their research findings with the IR.

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(3) Availability of a ***funding model*** to fund IR activities including staffing, ongoing archiving and technology for sustainability. Most IRs may be started as experiments with small budgets but when they takeoff, and their importance becomes eminent, experimental budgets cease to be operational. Swan (2008:22) therefore, advises that inclusive in the model are periodical budgets or financial plans, a monitoring and forecasting process should also be in place. The IR team should reflect how the service would be sustained and value for money met. About funding, Poll (2001:248) contends that the funding model used in any IR should be reasonable, commensurate to the effort and reflected in usage statistics. IRs being the green route of open access, the team should be aware of the best funding models that would ensure IR sustainability since scholars are interested in the sustainability plan and access through the IR as an institutional supported platform.

(4) With ***measurement*** as a factor why IRs succeed, Westell (2006:216) and Shearer (2003:255) agree that input activity is key to successful IRs. Populating repositories is a challenge widely discussed by many IR scholars. Regardless of the variety of the collection an IR takes up, other factors such as the framework for adding content (self-archiving or added by IR staff), amount of born digital materials and those to be digitized and the quality of the material are critical in developing the IR collection. The ability to gauge usage of IR content on and off campus, the number of hits, views, downloads, comments and links shared are all an important pointer to evaluation of the IR and its content. Those may be good but not sufficient to convince authors to deposit their work in the IR until it is in position to track citations and analyze their contribution to scholarship.

(5) ***Promoting*** the repository first to the librarians then to the faculty members is a very crucial factor to be done tirelessly. This can be done using social media platforms, scholarly platforms, consortia and other avenues to reach out to both users and authors. It can also be done through offering user support services through quick links or instant messaging services (Mukhlesur & Mezbah-ul-Islam 2014:59; Westell 2006:217; Poll 2001:248). User support takes into consideration helping the authors with self-archiving and the users with technical assistance and searching of content (Mcfadyen 2010:6). Secondary to support services is creating trust between research groups and the IR team in form of developing partnerships, understanding researcher's environments and delivering successful IR services (White 2008:8). Promotion also takes into consideration user awareness including making authors aware of OA,

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copyright issues and general scholarly communication issues and developments (Swan 2008:22).

(6) *Preservation strategy*: Having a preservation strategy for digital longevity of IR content contributes to IR success. Having a strategy in place to migrate and preserve IR content in case of system change is equally important. Depending on ability, institutions use backup servers, cloud storage while others don't care about long-term preservation due to limited resources and ignorance. At the very least, there should be preservation policies pointing to future progress. Schultz & Zierau (2013:4-5) discuss various case studies and models that can be applied in the Distributed Digital Preservation (DDP). Among the case studies Schultz & Zierau assess include *Archivematica* - a Community-Driven Support for DDP. Archivematica highlights best practices for carrying out coordinated technical approaches to accomplish digital preservation using modularized and flexible platforms. The second case is *Chronopolis.* This is balancing partnership for DDP, which focuses on describing the importance of positioning and coordinating administrative responsibilities across many independent organizations working together in a shared and distributed repository infrastructure. Others include Danish Bit repository (shared flexible bit preservation among institutions for DDP), Data-PASS (coordinating stakeholder for DDP), DuraCloud (leveraging Cloud infrastructure for DDP), Internet archive (Fit-to-purpose roles & responsibilities for DDP), MetaArchive (building community for DDP) and UC3 Merrit (dedicated services for DDP). Depending on the nature of the IR, the team can choose to adopt any of the above approaches.

(7) *Interoperability* is one of the key eternal factors that Westell proposes for IR success. This function refers to the ability of an IR to work with other systems, repositories and networks. Cross repository searching will require compliance to OAI-PMH which is facilitated by some IR software. Search engines and other institutional systems including the library system would need to work with the IR to harvest metadata, deliver search results, compile statistics and many other ways. This can be achieved over Internet protocols which need to favour inter-communication between the IR and other systems. If it is not imbedded into the system, then it is usually set at the installation stage. Lagzian et al. (2015:148) add that software usability impacts on user experience in digital repositories. An IR that easily operates with other systems is most likely to succeed because it is easy to populate.

(8) The ***relationship between the digitization centers*** and the IR should be an explicit one for successful IRs. This is one sure way to populate the repository if the two interact, but also widens IR access. Linking the IR to the digitization center or webpage increases visibility and possibility of access to the resources that are in the repository.

Westell's factors for success have been criticized as limited to the level of integration of the IR with other existing research initiatives (Jantz & Wilson 2008:10). They however, present a strong case to reflect on for repository managers and the team at large. They cannot be disregarded in anyway because they present a strong caution to those intending to start repository services.

2. 7 Indicators for IR success

While researchers suggest various indicators of IR service success, the researcher could not find agreement concerning whether any are fundamental for all IRs or if success is entirely a local phenomenon (Yakel et al. 2008:1). Research has been conducted on various IR aspects such as self-archiving (Xia & Li Sun 2007a:16), assessment of faculty needs to align them with the service, sustainability (Cassella 2010:211) and keys to successful digital repository deployment (Mcfadyen 2010),which are arguably regarded as success indicators of an IR service. From the start of the IR implementation process, IR managers ought to learn that populating their repositories so that they create a critical mass of relevant content is the single most important success factor. This however, does not translate into populating the repository with everything institutionally produced regardless of their quality. For example, Crow (2002:6) argues that content deposited in an IR represents institutional quality, meaning good content should be collected and as the repository matures, it builds a critical mass of institutional intellectual quality. The faculty members are tasked to support IR services with good quality work. Thibodeau (2007) developed a framework for evaluation of IR services. In his evaluation framework, he includes service, orientation, coverage and collaboration. With service, Thibodeau refers to roles for members of the community, orientation refers to the operating continuum between preservation and access, coverage refers to content, while collaboration signifies whether the IR collaborates with others or works alone (Yakel et al. 2008:1; Lagzian et al. 2015:148). State refers to maturity in the development of an IR. Within each of the factors, Thibodeau offers metrics for measuring success. This is more general and with evaluative questions to guide IR managers to assess the success. A more focused analysis is presented by Xia & Sun (2007b) where they subcategorize, for example, the number of

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deposits   broken down by class, subclass, faculty, version, type, date, depositor, location, availability of full text, cost per deposit and usage assessment.

Cassella (2010) comprehensively reviews IR success indicators and reorganizes them into external indicators, indicators related to growth, finance, internal perspective and users. This research therefore, adopts and discusses IR success indicators as presented by Maria Cassella.

2.7.1 Indicators related to staff training and growth

It may be an initiative of one or two staff to develop IR services. Once adopted as an institutional activity, building a competent IR team and supporting it with necessary training becomes an institutional activity. Funding IR activities is fantastic so is staffing the IR team with qualified human resources. An IR is perceived to be successful if allocated full time human resources devoted to IR activities only. In a CLIR report, the average human resource that worked on IR activities in the USA was reported to be at 7.2% and cost on IR full time employees and vendor fees at 75% of total IR budget (Markey et al. 2007). The number of staff needed at IR implementation tends to increase as the IR activities grow. Relatedly, staff need regular training in IR activities every time new members are added to the team, there is need for orienting them and training them in IR activities. The will and subsequent support in realizing this is an IR success indicator. Two aspects related to learning and growth therefore stand out;-

- The number of full-time employees dedicated to IR work.
- The expenditure on staff education or training in IR activities.

Where there is will to meet the growing demand of full time IR staff by the administrators; and support to carry on continuous professional development, is an indicator of IR success and growth.

2.7.2 Indicators related to financial perspectives:

Although an IR is one of the Open Access routes, it is neither free nor costless. Researchers incur costs during the process of preparing content and depositing it with the IR. Startup and maintenance costs, depending on the set variables, are also costly. Training of IR staff and promoting IR services also incur costs that cannot be ignored. According to the Association of Research Libraries, Systems and Procedures Exchange Center (ARL SPEC) Kit 292 and Bailey et al (2006:15), the startup capital of an IR in the USA cost been $ 8,000 to $1,800,000 and operating costs between $8600 and $500,000 and maintenance capital of $50,000 to $100,000.

In a more recent study, Giesecke (2011:533) estimates IR operational costs between $130,000 and $248,000 per year as reported from Massachusetts Institute of Technology (MIT) IR. Burns et al. (2013:5) review and report on some operational costs such as the costs of scanning a page locally accounted for $0.27. The Joint Information Systems Committee reported the cost of self-archiving to stand at $14.90 per document (JISC 2009), while ongoing costs account for $159,000 per annum. Ongoing costs include mediation service costs (where librarians peruse and approve for submission items into the IR) and others associated with the IR. Although Cassella (2010:218) postulates that there are *costs associated to each deposit,* the three authors above illustrate how costs are spread over the process of having IR deposits. This however, should not be an impediment to IR service delivery where the depositing model does not necessarily require incurring such large sums. What cannot be ignored is the fact that the IR requires a budget to efficiently operate. Xia & Sun (2007b:77) propose that the cost per deposit can be calculated by considering the total number of content documents and total cost of an IR development. This encompasses all other costs necessary for running an IR including the installation costs, preservation, maintenance, promotions and staff remuneration. Where an institution recognizes IR costs and has the will to fund IR operations, it can be an indicator of a successful repository.

Another financial indicator is to do with downloads. Cassella (2010:219) argues that the cost per download is important in evaluating the scholarly effectiveness of the IR collection. Recent versions of IR software such as DSpace come with inbuilt statistical collection abilities. Many still accept add-ins where the statistical component is not good enough. COUNTER can be used to collect and evaluate the efficacy of IR statistics as an extended option. The cost per download can be derived from the proportion of the IR *ongoing cost* for a given period (year, month) divided by the *given downloads* in a given period (annual, monthly) (Cassella 2010:219). The higher the download cost the less successful the repository is perceived to be, while the smaller the download cost the more successful an IR service is perceived to be. In summary, success indicators in relation to financial aspects can as follows:

- Cost per deposit where by an IR is perceived to be successful if an institution acknowledges that populating an IR whether through self-archiving incurs costs which should be borne in the IR budget regardless of being an Open Access initiative.
- Cost per download, where the smaller the cost of download is perceived of the repository to be successful than if it is high.

2.7.3 Core indicators from the internal perspective

These relate to the assessment of the service, the value the IR as a service adds to the institution and takes into consideration assessment of items deposited on an annual, monthly and daily basis, items available in full-text (both documents and articles) and active collections in the IR.

2.7.3.1 Annual deposits

Although the number of documents deposited in an IR may not exclusively assess IR success, combined with other measures and factoring in the IR deposit policy it becomes important to consider the number of items in a repository. In examining IR success by annual deposit numbers, we examine the balance between the formats, number of expected deposits, population per community, type of materials (journal articles, conference papers, digitized special collections, theses and dissertations e.t.c), metadata records versus full-text articles are used to measure success. The number of full-text articles, for example, develops a critical mass of an IR content. However, according to good practice, a successful IR is one that will have other item formats alongside the full-text documents, spread across all communities and deposited all year round. In other words, only when annual deposits are spread across communities and in different formats is it an indicator of IR success.

2.7.3.2 Number of items deposited daily

Where an IR promotions team succeeds in convincing the research community to continually deposit their research output with the IR, and they acknowledge the IR as a one of the avenues for disseminating their research output, then the IR is said to be on the course to success. This is manifested in the daily deposits made to the IR from various authors. The research communities should recognize the advantage of depositing their scholarly output with the IR.

2.7.3.3 Availability of full-text documents and articles

Since IRs are ideally a repository of research findings and scholarly items, regardless of the restrictions there may be, it should have some full-text documents. It can be reports, journal articles, dissertations, research data, book chapters, conference presentations, course learning materials (notes) or learning material in multimedia. Where there are restrictions, at least abstracts and a few metadata fields can be accompanied by the link to full-text sites. With only metadata and no full-text documents, an IR is just a shell and not developing. Researchers value a variety of good scholarly sources such as e-journal articles, preprints, encyclopedia articles,

datasets, blogs, statistics, discussions, commentary, critiques and scholarly hubs (Maron & Smith 2008:6), but often want to read more content beyond abstracts.

2.7.3.4 Number of active documents in the repository

According to Cassella (2010:217) the quantity, variety, richness and quality of the collection of a repository are good indicators of IR success and will attract the attention of researchers, depositors and retrievers/readers. Active documents comprise the documents that are used on a regular basis or publications by prominent authors. They can be course content material or published articles.

2.7.3.5 Value-added services

Value-added services is secondary to having a variety of collection. Aligning a rich array of value-added services to researchers' interests indicates IR success. In their study of international usage of IR items, Fralinger & Bull (2013:143) were stunned by the level at which IR administrators were unaware about a lot of things on IR services. Among the least known was the value-added services. Among value added services Schöpfel (2013) suggests improving quality of items input, variations in metadata, format to include full-text articles not just metadata, interoperability at regional, national or even international level, commentary, referencing with different software and styles, sharing through email among other. IRs can have interactive social media tools (Waddington et al. 2012; Millard et al. 2010), federated search capabilities, metric and usage statistics reports (Walker 2011), video presentations of theses, print on demand in book format, creative commons licenses and preservation in multiple copies. Critiques and comments present other divergent views of readers/users that offer authors alternatives for revisions and newer versions of their articles. Mcfadyen (2010:7) adds services such as the YouTube academic applications, web-conferencing archives, streaming, iTunes U access, NC virtual ability, podcasting and many others, to repositories geared at learning.

2.7.4 User perspective success indicators

According to Casella (2010:214), users associate IR success with metrics representing interaction of researchers in their two-fold role of depositing and retrieving items in the repository. It therefore, examines the rate of depositing by institutional affiliated authors and the average number of items deposited by the author. This is aimed at establishing the growth and effectiveness of the self-archiving practice among faculty members which Poll (2001:249)

refs to as market penetration. This indicator is also important in measuring the most active communities, the self-archiving patterns and age of self-archiving authors. Successful IRs attract both depositors and retrievers. It must be popular among the users, and they should perceive it as either their one stop center for their research needs or as a publishing center for their articles.

2.7.5 Other indicators

Budget cuts among academic institution are so common and a major impediment to successful operation of services. Where an IR team secures ***external funding*** to supplement parental funding, at any level of the project, then it is perceived to be successful. This normally happens with interoperable and federated repositories. The mission of the parent institution and proactivity of the IR team determine whether it will attract local or international funding. Some agencies that fund research and open access initiatives may be willing to fund some IR activities if contacted with good funding proposals.

Participation in projects such as the open access campaign, research data management and self-archiving projects, not only popularize the IR, but they are indicators of IR quality. In Europe for example, project DRIVER II (Digital Repositories Infrastructure Vision for European Research) collects content across various discipline. Over two million records are shared amongst 33 participating countries with just 249 repositories (International Council for Scientific and Technical Information 2010:7). Participating repositories have over time learnt from others to collaborate and develop better quality research output through this project.

Swan (2008:22) argues that ***workflow practices*** such as quality control procedures, throughput times progress, forecast procedures, anticipated peaks and troughs smoothed and repository embeddedness in the institutional objectives indicate IR success.

Lagzian et al. (2015) study six factors including management, services, technology, self-archive practices, people and resources, to which they attach IR success. Many of these relate to factors discussed earlier. Their slightly different argument from that discussed above as regards to repository service includes technical support, resource sharing and regular maintenance. Lagzian's argument about technology as an IR success indicator allude to the fact that the software adopted is easy for all to use whether for retrieval or depositing. About people and resources, Lagzian argues that the organizational culture, top management philosophy, support and favorable IR policies, affect growth and use of IR because they influence group

perception and decision-making (group think), which may favour or fail the service. Self-archiving is one of the major methods of populating a repository. However, the practice is developed over time and the style of approach, for example, depositing documents only or depositing documents and metadata, dictates whether the service will be successful or not. Depositing with metadata eases the team's work but if made rigid, depositors with developing metadata may abscond from depositing.

The factors mentioned above, provide some kind of framework for evaluating institutional repositories. Important to note is integrating the IR services in the overall institutional objectives, achieved through building a critical mass of content (Shearer 2003; Bell et al. 2005; Ferreira et al. 2008) that is accessible to users, sustainably funded and well planned IR services being major too. Equally important to note is the continuous promotion of the service. It should never come a time that enough about the promotion has been done. An IR like a library, is a growing mechanism. Users come and go like wise authors. Constant promotion bridges the information gap between the new comers and the would-be users of the service.

2.8 Common IR challenges and reasons for not achieving success

Institutions implement IRs with the purpose of collecting, storing, indexing, preserving and disseminating an institution's or a network of institutions' scholarly output in digital format (Crow, 2002:16; Burton and waters, 2004:10; Bailey-Jr, 2005:260; Shearer, 2013:251). As earlier discussed, IRs are categorized under the green route of OA, to publish and preserve for long-term access, scholarly works related to an institution. All this is done but with challenges. There are grand-scale challenges that IRs face that are both operational and systemic in nature. A number of scholars have researched about challenges faced when implementing and running an IR. Barton and Waters (2004:12) cite low adoption rate by academics, lack of proper IR sustainability plan, policy development challenges, management of intellectual property rights, waving university support, recurrent management costs, costly digital preservation processes, challenges related with the identification of the project team and key stakeholders being common in institutions. Rao (2007:691) adds institutional culture (ease of inter departmental relation), the scope of the repository (width and depth of content), criteria of depositing into the IR (easy or complex by user's standards), access levels (policies for access and use), sustainability and funding. Otando (2011:3) adds staffing, poor or no infrastructure and lack of proper promotion strategies. Jain et al. (2009:4) cites recurrent costs involved in management of IRs, difficulties in generating content, difficulties in sustaining support and commitment,

rights management issues such as ignorance of author rights and absence of IR policies. IR challenges are aggravated where depositing content involves self-archiving and authors can only do that when motivated by incentives. Where authors are reluctant to deposit content or provide bibliographic details, perceiving it as time consuming, there should be an option such as librarians to do deposit and add metadata for them. These challenges are not unique to the some countries but crosscutting to many other countries.

2.9 Concerted effort in IR establishment

It is from such challenges and others related to dissemination and access to information that a number of initiatives have been started. For example, the SHERPA project formed between 2002-2006, spearheaded by the Consortium of University Research Libraries (CURL) and the Joint Information Systems Committee (JISC) in the UK, aimed at implementing an open access IR concept that would help alleviate costs related to use of electronic information resources (University of Nottingham 2006; Drake 2004). The initiative now runs four services; SHERPA RoMEO which deals with publisher's rights, SHERPA JULIET that outlines research funders archiving mandates, Open DOAR which is the worldwide listing of open access repositories and SHERPA search which is the simple full text search of UK repositories. Other initiatives lead to formation of such products like DSpace software, eScholarship, bepress, Ohio-State University (OUS) Knowledge Bank, eprints (Drake 2004) to mention a few. Some of the initiatives geared towards achieving big goals may not be fully explored by single institutions.

In an interview with Mrs. Susan Veldsman, Director, Scholarly Publishing Unit at Academy of Science of South Africa (ASSAf), she stressed that consortia are very powerful organizations that signal unity of their stakeholders in many ways. She added that they are eligible to grant opportunities to support open science, hosting at reduced costs, promote knowledge sharing events, gain expertise in creating and managing sustainable library consortia, train and participate in important library areas such as negotiations and licensing, open access, copyright and open source tools. Against the above attributes, South Africa was able to lobby other organizations like EiFL, academies and universities to establish successful repositories. It took a national champion who advocated for funding of trainings of local champions at individual universities to establish success repositories in South Africa. Other initiatives have been carried out in Bangladesh, China and many other European countries. Consortia are strong tools that can be used to overcome challenges institutions or members are stuck in. They can be advocates for training in IR knowledge, advocates for open science, raise member institutions' visibility

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as a member of the global network, and participate in global fora for developing solutions to recurrent challenges.

2.10 CUUL in Uganda

CUUL is the consortium of Uganda University Libraries formed with the vision to create world class libraries and mission of being a leading hub for information access and resource sharing to enhance knowledge and research for development (CUUL 2016). CUUL has about forty (41) university, college and polytechnic library members. The consortia aims at creating a forum for conferences, workshops aimed at training libraries on issues of information networking, resources sharing standardization and modern trends in librarianship. It also aims at promoting and sustaining the consortium, ensure human resource development in library and information science skills at all levels, promote information capturing and co-operative information processing. It also has an objective of registering a code of conduct and professional ethics. CUUL lives to raise funds for consortia activities through income generating activities, engage in activities geared towards development of consortia, develop marketing strategies and service performance indicators.

2.10.1 Membership

According to the CUUL website, the consortium has three categories of members, that is, the public university libraries, private university libraries and affiliate members. By 2016, there were seven (7) members under public university libraries, twenty eight (28) private university libraries and fifteen (15) affiliate members. The affiliate members comprised of tertiary institution libraries such as polytechnics, government body libraries like the central bank library, parliament library and other government organ libraries.

2.10.2 Typical CUUL projects

CUUL has been involved in a number of projects that relate to information literacy, access to electronic resources, open access and various training. Notable among CUUL projects was the Open Access Awareness and Advocacy which was funded by EiFL and the ongoing open access policy development. CUUL in partnership with the International Network for the Availability of Scientific Publications (INASP) and Food and Agriculture Organization (FAO), World Health Organization (WHO), access several electronic information some freely while others through paid up access. It works with services providers such as Libhub KIOX, Ezy proxy and ebrary to access electronic resources at affordable prices.

Establishing functional IR services to help CUUL member institutions to dissemination research done at its member institutions could be another project added onto to CUUL list of projects. IR services increase institutional visibility globally exposing authors to international collaborative opportunities. This builds human capacity, promotes good practices in authorship and exposes them better research skills. Implementation of IRs under consortia has an edge over individual institutional implementation because it builds a corpus of subject knowledge at local level, reducing information consumption and promote information generation, a very big challenge in African universities (Larson & Watson 2011:2).

2.11 Research gap

Very little has been written about IRs in Uganda. Not much has been written about individual IR implementation in any institution, their implementation approaches or any concerted approaches to IR implementation. None has taken interest in establishing the statistics of operational IRs in academic institutions in Uganda. There is need to carryout a comparative study on the impact IRs have made on institutions with them and those lacking them in terms of academic research visibility performance. Lack of such information is one reason some institutions have failed to establish functional repositories. On top of little information, IR implementation is failing because institutions have not fully utilized the concerted effort through the consortium, to pool resources and use better technology to implement IRs in all institutions. There is need to explore the strength of consortia in dealing with general problem.

2.12   In summary

This chapter reviewed literature related to IR implementation. It covered open access as an initiative implemented through IRs, how IRs can co-exist with commercial publishing and the concept of an IR in the university context where it was discovered that IRs could be departmental, subject or all-inclusive depending on the ability to sustain them. The chapter explored the options available while planning to implement an IR services and reasons why IRs succeed. The chapter has also examined the different IRs success indicators and established that there may not be a generally agreeable set of indicators. Despite that, the study agreed with Maria Cassella's categorization of success indicators, that summarizes them into: those related to staff training and growth, finances, internal perspective and user perception. The chapter explored common challenges repositories face and reasons for failing to implement successful IRs. Different IR initiatives that have led to tremendous progress such as developing IR software like DSpace and SHERPA have also been explored. The chapter hinted on CUUL,

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typical CUUL spearheaded projects and membership. However, there still exists a research gap on the typical role, the approach and strategies that a consortium in a developing country like Uganda can approach successful implementation of IRs in member institutions. This study tries to address that gap in chapter 4 of the study.

CHAPTER 3: RESEARCH METHODOLOGY

Research is what I'm doing when I don't know what I'm doing, - **Wernher von Braun**

3.1 Introduction

This chapter defines the methodology used in this research. It addresses the research paradigm, the research design and the data collection methods used. It highlights the scope of the research, the sample population and the sampling technique used. An addendum for a data management plan is added.

The research investigated the role CUUL could play in the implementation of successful institutional repositories in the Central Region of Uganda. Although a few institutions in Uganda have established IRs, a paucity of activity is reported on the factors that lead to successful implementation of IRs in Uganda (citation required). Despite this, a number of institutions are engaged in setting up and running IRs (citation required) and these institutions would need to address such factors to enhance the possibility of their success. This study strives to identify, from established IRs, how CUUL could intervene to help member institutions in establishing and running successful IRs.

3.2 Overview of the Goal of the Study

CUUL is a confederation of research and academic libraries in Uganda. It was formed with the purpose of facilitating effective and efficient collaboration and resource sharing among university and institutional libraries in Uganda. One of its goals is to strengthen the library services provided to the students, staff and other patrons of the member institutions of this body(Consortium of Uganda University Libraries, 2015).CUUL has succeeded in creating a platform for member institutions to network, share resources, standardize library operations and pursue modern library trends. With a membership of seven public libraries, twenty eight private libraries and fifteen affiliate members, there is a strong bargaining power and shared capacity to approach and tackle common challenges, including the IR challenge in a number of member institutions.

In a preliminary survey carried out by the researcher, Uganda had only two IRs registered with Open Directory of Open Access Repositories (Open DOAR). These were Makerere University IR among university libraries and among affiliate libraries is the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) IR (University of Nottingham, 2016). Open DOAR provides a listing of quality-assured Open Access Repositories worldwide. Having only

two IRs on such a listing would only depict a challenge that should attract CUUL's immediate attention. The study further indicated that other institutions are struggling to establish functional repositories and are at different progress stages. It was further revealed that CUUL had attempted to confront the challenge before; under the first phase of the Open Access Advocacy and Awareness project, which handled open access awareness. The consortium is currently involved in the second phase of Open Access Policy Formulation, which focuses on assisting participating institutions in developing open access policies. Although these steps are relevant towards the implementation of a successful IR, they have two major challenges: they do not include all CUUL member institutions and they do address more of open access than IRs. This research, therefore, aims at establishing the current IR progress with the different member institutions in Central Uganda, and their thoughts about what CUUL can do to help them implement successful IRs for better institutional publications dissemination and institutional visibility. Section 3.3 addresses the research paradigm and the research design for this study.

3.3 Research Paradigm

Jonker and Pennink (2010) as quoted in Wahyuni (2012:69) explain a research paradigm as a set of fundamental beliefs and assumptions about how the world is perceived; that forms a thinking framework, which guides the behavior of the researcher. It shapes how one conducts the study; and it is prudent to adopt a research paradigm at the start of the research process. Scholars extensively explain four research paradigms, namely; Positivism, described as naïve realism; post positivism, known as critical realism; interpretivism, also known as constructivism and pragmatism (Heppner et al., 2008:20; Wahyuni, 2012:70). According to David & Sutton (2011:628), positivism is the belief that world knowledge can be detached from ethical evaluation (focus is on facts without considering ethical judgments). Interpretivism, on the other hand, focuses upon how subjects create their social reality by interacting with each other (David & Sutton, 2011:78),meaning it is socially constructed. Pragmatism as another research paradigm is an approach to understanding the world as being real and only knowable through our particular and practical engagements with it (David & Sutton, 2011:191). Critical realism or postpositivism focuses on the historical developments and the mechanisms at work beneath the banal appearance of economic and social relationships (David & Sutton, 2011:77).

All research paradigms can be applied in major research categories such as social research, experimental research, applied and other research. Owing to the qualitative nature of this research, the researcher adopted post positivism as the research paradigm. This research paradigm supports both qualitative and quantitative research types, supports objective ontology and focuses on explaining phenomena in context of real life. CUUL members have their own opinion about IRs that form their real life views about phenomena under study. Their progress, their challenges, knowledge of CUUL and projects conducted under CUUL, how they think CUUL can approach the IR challenge at hand, and other aspects form part of their real life. The research using ethical judgment analyzed these real life aspects in chapter four in order to come up with recommendations in chapter five.

3.4 Research Type and Design (Approach)

Research type, according to Kombo & Tromp (2006:9), can be qualitative or quantitative. They further assert that research design can be descriptive, experimental, correlational, case study and cross cultural (Kombo & Tromp 2006:70-72). Research type describes the form of research while design explains the structure of research. Research design binds the other elements in a research project together. It describes the core for making the interpretation of data possible and establishes the format for detailed steps to follow when conducting the study. For any research type and design a researcher chooses, relevant data collection tools and analysis approaches are employed (Wahyuni, 2012:70) simply because not all data collection tools and research analysis apply to all research types given their unique beliefs. This research employed the qualitative research type and uses case study research design, which is further discussed under the next subtopics.

3.4.1 Qualitative Research Type

Heppner et al. (2008:9) use several aspects to explain qualitative research. By product, qualitative research results are written in everyday language and presented in any media. Qualitative research is also used for both academic and non-academic purposes and audiences. Qualitative research also undertakes studies whose goals are descriptive, interpretive, critique and involve change. With this research type, the investigators, participants and transformers are recognized at the analysis stage, but respondents' opinions make the biggest portion of the research, depending on the research paradigm chosen. The role of the researcher in qualitative research is to gain a deep intense and holistic overview of the context under study (Gray, 2012:101). The study may involve interactions with individuals in a community or groups,

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seeking opinions about a phenomenon in its natural setting. The researcher having adopted the critical realism research paradigm ensured that all data captured was based on the respondents' perceptions and was interpreted thematically. This ensured that the findings remained authentic in all contexts.

The researcher chose to apply qualitative research because qualitative research allows for detailed research on small research. It is not built upon a unified theory and it can therefore adopt various theoretical stances and methods which are highly contextual because it is done in a real-life setting. Heppner et al. (2008:7) add that qualitative research adopts a relative ontology. They further explain that a relative ontology considers the respondents' responses in their multiple realities as they are individually constructed. The method also allows intertwining responses for descriptive and inductive interpretation. As earlier highlighted, qualitative research embraces a number of research designs, including the case study design. The researcher employed the case study design. The researcher thus used the case study design to study the progress of IRs in CUUL member institutions in the Central Region of Uganda, looking at their progress, reasons attributed to their current state, the approach CUUL can take to salvage the situation and the evaluation of previous projects spearheaded by CUUL.

3.4.2 Case Study

Case study is both a qualitative and quantitative research design. It facilitates deep investigation in real life and contemporary phenomena in its natural context (Woodside, 2010; Yin, 2012 and Wahyuni, 2012:72). A case study design is also ideal where multiple cases are studied. To attain research objectives, the case study selected in this study was about the CUUL member institutions found in the Central Region of Uganda involved in IR implementation. The researcher was interested in university libraries which had CUUL membership because these are much more involved in knowledge generation and are expected to have a lot to share to increase institutional visibility than affiliate institutions do. More so, CUUL was initially a consortium of university libraries, although it later included libraries involved in research as well as specialized libraries. Regardless of the category, most of these institutions share a lot in common in terms of management, ownership, policies, scholarship, organization and other factors that influence IR project establishment.

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3.4.1.1 Benefits of Case Study Design

- It allows in-depth investigations of the problem at hand because it brings out deeper insights and better understanding of the problem (Kombo & Tromp, 2006:72)

- It is a good method to challenge theoretical assumptions and highly favor lived reality. It has ability to recollect more of real life than many other types (Murphy, 2014).

- It is flexible in a way that it can be conducted at various points in the research process (Murphy, 2014).

3.4.1.2 Disadvantages of a Case Study

- Yin (2012) explains that with case studies it is hard to draw definite cause-effect conclusions in studies that involve cause and effect relationships.

- It is also hard to generalize findings from a single case study, especially where the universe (population) is so diverse in character.

- The approach is prone to research biases, especially where a researcher does data collection and interpretation.

- According to Murphy (2014), a case study exhaustively facilitates in-depth (deeper) study but loses wider (breadth) study of a phenomenon.

3.5 Data Collection

According to Ut (2013:9) and Hox & Boeije (2005:593), collecting data for qualitative studies can be done using primary and secondary methods. Primary data collection is a method where the researcher undertakes all the processes of data collection including setting the research questions and determining data analysis (David & Sutton, 2011:205). There could be topical areas that can be explored further using existing data that had been collected, coded and entered in data files. Using such sources as data files is what is known as secondary data analysis. The purpose of secondary data is to extract relevant information from previous studies, to find facts, to carry out data mining activities, to model, build and identify relevant sources (Ut 2013:4). Primary data collection usually happens in any of the following four methods:

a) Direct observations: This involves collecting evaluative information by watching the subject in its natural or usual environment without altering the environment.

b) Participative settings: This is where the researcher is directly involved and is part of the work team of the subjects under study. It is an inquiry where a researcher collaborates with the subjects involved in the study.

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c) In-depth interviews: It is a technique where intensive individual interviews are conducted with a small number of respondents with the intention of exploring their particular view about phenomena (Yin, 2009:107).

d) Document analysis: This involves using documents to support academic study and point of view. It comprises a lot of reading, interpreting patterns, classifying patterns and generalizing results.

Secondary data complements primary data in such instances. The two data collection approaches may not differ in the methods used to collect the data but the sources of the data may differ. Secondary data may be provided by the organization under investigation or collected elsewhere.

This research made use of two methods of data collection mentioned above; the interview technique was used to collect empirical data, while documents were reviewed and relevant information to the study. Aspects reviewed from relevant documents were reported in chapter 2 and empirical findings in chapter 4 of this document.

3.5.1 The In-depth Interview as a Method to Collect Data

Conducting interviews as a method of research involves asking questions. The main purpose of an interview is to provide the interviewees with an opportunity to share their perspectives, stories and experience regarding a particular phenomenon being observed by the interviewer (Wahyuni, 2012:73).

An interview usually requires a list of questions that needs to be used by the interviewer (Cohen & Crabtree, 2006). Kombo & Tromp, (2006:93) categories them into: *focused interviews*, where a topic is intensively investigated with the aim of gaining understanding of the topic. The focused interview is based on the respondent's opinion about a situation he/she has been involved in (Yin, 2009:108). The *case study interviews* involve collecting in-depth understanding about a case or cases of interest. To those Gray (2009:370) adds non-directive interviews, informal conversation interviews, unstructured interviews, semi-structured and structured interviews. Usually with focused interviews, the interviewer has prior knowledge of the situation and keeps focusing the respondents when they drift off. Non-directive interviews are used to explore an issue in depth and questions are usually not preplanned, although the research remains focused on the research objectives. Unlike other interview approaches, the informal conversation interview relies on spontaneous generation of questions as the interview progresses. It is the open ended version of the interview technique (Gray, 2009:373). Structured

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interviews make use of standardized questions that are posed to all respondents. The semi-structured interviews are not standardized and are often used in qualitative research. The interviewer prepares a list of items to be covered but may alter order to probe further. With the unstructured interview approach, the researcher has an idea of what is to be covered and may use a topic list as a reminder, although order is not strictly adhered to. With the unstructured interview, neither specific questions are asked nor a range of possible answers are predefined (Kombo & Tromp, 2006:92).

Creswell (2003:178) identifies four important aspects about participants and sites for data collection, which are very pertinent with the interview method employed in this research. They include the following:

1. *The setting*: The place where the interview takes place should be conducive and free of any interruptions that may alter results. The researcher conducted interviews in the respondent's premises of work, at a time of little duty interruptions.

2. *The actor*: This refers to the respondents who were interviewed. The most competent respondents were selected for this study using purposeful sampling.

3. *The event*: The central phenomena that actors are interviewed about. The researcher investigated IRs in the Central Region of Uganda; exploring the institutional progress on their IR and the role CUUL could play to help member institutions implement successful IRs.

4. *The process*: How events were undertaken by the actors within the setting. The researcher conducted a preliminary survey in selected institutions in the Central region of Uganda and developed an interview guide. The tool (semi-structure interview guide) was tested with one institution to establish clarity of questions and ability to yield results relevant to the research. Having explored all interview types an categories, the study employed a semi-structured interview approach to collect empirical data.

3.5.1.1 Benefits of the Semi-Structured Interview

According to Kombo & Tromp (2006:93), semi-structured interviews:

- Contain both open-ended and close-ended questions, making them flexible;
- Enable collecting in-depth data since they employ both open-ended and closed questions;
- Questions can be prepared ahead of time; and
- Semi-structure interviews can provide reliable, comparable qualitative data.

3.5.1.2 Drawbacks of Using Semi-Structured Interviews

Further Kombo & Tromp (2006:93) argue that semi-structured interviews:

- Can be time consuming where the respondents and interviewer are wordy;
- Data analysis may be problematic if there are no interrelated data; and
- Where close-ended questions are asked, respondents may be cautious with the answers.

3.5.2 Data Collection Tool and Procedure

A tool (interview schedule)was developed and tested. The purpose was to establish whether the questions are clear and can be trusted to return the desired results. The interview schedule was emailed to the selected respondents beforehand. This was intended to enable respondents to prepare for the interview in advance (see appendix I for the interview guide and appendix II for the interview schedule).

This was followed by the actual interview sessions at the respondents' university premises, and sessions were recorded orally. The interview session commenced with briefing and signing of an informed consent form. The audios were transcribed in text for easy analysis and interpretation, and emailed to the respondents to confirm if the textual transcriptions clearly represented their views.

3.5.4 Data Collection Ethics

Several ethical considerations were implemented in the data collection process. The process of research is costly; therefore, every ethical code was observed to avoid any instances that could make this research unethical. Among the ethical considerations, request for approval to carry out this research was cleared by the University of Pretoria, Faculty of Engineering, Built Environment and Information Technology under the School of Information Technology. The researcher also sought permission to carry out research from the respondents' institutions. Respondents were duly briefed before the interview session, including the researcher introducing himself and explaining the objectives of the study to the respondents before the interview session began. All respondents had the right to willfully participate in the study, ensuring that no respondent was by any means persuaded or forced to participate. The identity of respondents was not revealed and data collected was held in paramount confidentiality. Data was used for academic purposes and might be published in journals too.

3.6 Scope of the Study

The study was limited to investigating the prevailing IR implementation progress and the role CUUL could play in establishing successful IRs in member institutions. The study sought to establish the factors institutions attributed to the current level of progress of the IR, the nature of the collection and what approach CUUL could take to successfully help establish IRs in member institutions.

3.6.1 Geographical Area Scope

The study was conducted in the central region of Uganda and involved CUUL university library member institutions, both private and public. Although CUUL had other affiliate member institutions in Central Uganda, some of which had established IRs, they were diverse in nature and thus were not considered in this study because results from such member institutions would be hard to replicate.

3.6.2 Time Scope

The research proposal was approved in January 2016. However, the data collection process lasted between September 2016 and October 2016. The pilot study, data collection, transcription, interpretation, analysis and presentation were all done within two months. A detailed report was made ready by end of November 2016.

3.6.3 Population and Sample Size

According to Kombo & Tromp (2006:76), population refers to a group of individuals, objects or items from which samples are taken for study. The population for this study comprised all CUUL members in Uganda. These included seven public university libraries, twenty eight private university libraries and fifteen affiliate members, totaling fifty. There were twenty four university libraries under both private and public ownership in the central region of Uganda. The researcher purposively sampled eight for this research. Respondents included repository managers and staff who work with IRs. As revealed from the preliminary survey, most of these institutions had one or two staff members involved with IR work. The researcher carried out a group interview session where an institution had more than one IR staff member.

3.7 Sampling Technique

This refers to the procedure used to gather and select respondents, places or things to be studied (Kombo & Tromp, 2006:77). The purpose of sampling is to identify participants from whom

relevant information can be extracted. Sampling is an important feature in any empirical study (Harrell & Bradley, 2009:31), especially where inferences about a population will be made and all characters/subjects in a research cannot be studied. A sample is therefore a representation of the entire population. The sample taken in any study greatly contributes to the research's validity and reliability. The sample must therefore contain elements that represent the characteristics found in the entire population. The sample is studied to gain insight in the whole population. According to Research Starters eNotes.com (2016) and Harrell & Bradley (2009:31), sampling can be random sampling (generalizability claims) where respondents are chosen on probability out of the pool, or non-probability (inferences), where sampling is done according to the researcher's judgment. The latter was applied in this study. Samples used in this study were selected purposively based on the researcher's knowledge of projects facilitated by CUUL and its current role in the establishment of IRs in Uganda.

3.7.1 Problem of Sampling

The sampling problem results from the challenge associated with selecting the sample that is adequate for a problem under study (Oppong, 2013:204). This arises, especially in qualitative research, to address issues associated with research credibility, findings and recommendations. The sampling problem also referred to as a sampling error arises when there is a very big difference between the findings and recommendations made using a wrong sample size (representative population) from those that would be using the universe (population/statistical universe). This study addressed the sampling problem by defining the geographical scope (Central Region of Uganda), required characteristics of respondents (IR managers and staff who at the same time are CUUL members in the university library category) aware of CUUL and her related operations.

3.7.2 Purposive Sampling

According to Hajimia (2014:31), purposive sampling is a process whereby a researcher selects a sample based on knowledge and experience the researcher has of the group sampled. It is also referred to as judgment sampling (Harrell & Bradley, 2009:32), subjective or selective sampling (Lund Research, 2012) and theoretical sampling (David & Sutton, 2011:232). The study employed purposive sampling strategy because it is appropriate for case study researches (Baxter & Jack, 2008:556). In addition, purposive sampling was preferred since the study targeted respondents who were knowledgeable, had the experience of working with IRs and were aware of CUUL.

3.7.2.1 Benefits of Purposive Sampling

Purposive sampling can be used for both qualitative and quantitative research (Kombo & Tromp, 2006:82). With purposive sampling, the sample selected is entirely based on the opinion of the researcher to select the most appropriate respondents (David & Sutton, 2011:232). This eases identification of respondents on the part of the researcher and improves the research validity because respondents will be assumed competent to answer research questions. The method favors selecting information-rich cases for in-depth analysis related to the central area under study. Qualitative research is conducted in multiple phases whereby each phase builds on another phase (Lund Research, 2012) and different sampling techniques may be required for each individual phase. Where each phase may require a different sampling technique, it can still be achieved with purposive sampling since it has a wide range of types to draw from.

3.7.2.1 Limitations of Purposive Sampling

With purposive sampling, the researcher uses own judgment to select the sample (Kombo & Tromp, 2006:83).This is likely to increase the researcher's bias compared with probability sampling. The researcher applies common knowledge and what is already known about his/her population to select a sample population. This becomes a limitation when the researcher's judgment is ill-conceived or perceived to have been poorly considered. Purposive sampling also lacks criteria and can be applied with a theoretical framework of an expert or with other accepted criteria (Lund Research, 2012). It is also quite hard to defend the sample representation of subjective sampling in terms of appropriateness. Questions about generalization often arise as to whether, with subjectively selected samples, one can really have their results applied to the rest of the population. Sampling is also prone to what is known as *gatekeeper's influence*. According to Oppong (2013:206), gatekeepers are authorities who interfere with the sampling exercise because of their authority to influence who should be sampled. They can be department heads or sectional leaders in the areas where research is carried out; or may as well refer to dominant characters in the sample.

3.7.3 Overcoming Sampling Biases

Qualitative research is prone to a number of biases; right from design, data collection, interpretation sampling and analysis. Bias is defined as any tendency which prevents neutral consideration (Pannucci & Wilkins, 2011:619). The researcher is likely to face sampling bias

and interviewer biases stemming from the non-probability sampling technique and the semi-structured interview data collection method employed in the research.

Sampling bias, according to Kombo & Tromp (2006:85), is a tendency to favor the selection of units that have particular characteristics. It mainly happens due to poor planning at the sampling stage. The researcher plans to overcome this bias by sticking to the sample population pre-determined by the geographical scope and characteristic. The interviewer bias happens when there is a systematic difference between how information is solicited, recorded and interpreted (Pannucci & Wilkins, 2011:622). It is mainly caused by the researcher's prior information about phenomena. The researcher carried out a case-by-case study and was objective to consider information as received from respondents, asked good questions, listened carefully in order to firmly grasp concepts studied and was willing to unlearn preconceived notions. Where information seemed to conflict, a chain of evidence was kept. The researcher pre-tested the tools and also emailed transcribed interview sessions for the respondents to confirm that their views had been well captured before carrying out data analysis.

3.8 Data Analysis and Presentation

Yin (2009:127) observes that analyzing case study evidence is one of the least developed areas; therefore, it is a challenging phase of qualitative research. Data analysis involves examining data collected and breaking it up into manageable themes to make meaningful deductions (Kombo &Tromp, 2006:117). Analysis of qualitative data varies from simple descriptive analysis to elaborate multivariate associate techniques, depending on the purpose of the study, complexity of the research design and ease of how conclusions can be reached (Kombo & Tromp, 2006:118). This research made use of thematic analysis.

3.8.1 Thematic Analysis

Thematic analysis is an independent qualitative descriptive approach that identifies, analyses and reports patterns or themes within data (Braun & Clarke, 2006:76; Vaismoradi et al., 2013:400). With the thematic approach, related topics are identified, categorized, and tabulated for easy analysis. According to Kombo & Tromp (2006:119), it follows that the researcher:

1) Collects data and identifies relevant information towards meeting research objectives;
2) Identifies a coding system developed based on samples of collected data;
3) Categorizes major issues or topics covered;
4) Cross-checks data highlighting key quotations and interpretations;

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5) Picks major topics and saves them in the margins;

6) Places coded materials under major topics identified. All material relevant to the topic is placed together;

7) Develops a summary kind of report identifying major topics and any associations between them in a tabulated format;

8) Uses graphics and direct quotations to present findings; and

9) Reports final analysis of findings.

3.8.1.1 Strengths of the Thematic Approach

A thematic approach to analyzing the data provides a purely qualitative analysis, detailed and nuanced account of data (Braun & Clarke, 2006:81; Vaismoradi et al., 2013:400). It is easily applied where there is a thematic map. According to Braun & Clarke (2012:60), a thematic map can be a visual or a text-based tool used to map out the facets of developing analysis to ease identification of main themes, sub-themes, and the interconnections between themes and sub-themes. The thematic analysis gives strong emphasis on using topics that emerge from the data, rather than imposing researcher beliefs (David & Sutton, 2011:365). The opinion of the researcher does not surface with the thematic approach, which helps overcome researcher bias. According to Braun & Clarke (2012:58), thematic analysis is accessible and flexible. It offers a gateway into qualitative research to new qualitative researchers and demystifies what seems vague and challenging. It is also limited to data analysis rather than it being a method of doing research.

3.8.1.2 Weaknesses of the Thematic Approach

The approach relies heavily on the judgment of a single analyst (Kombo & Tromp, 2006:120). This usually leads to high levels of subjectivity, hence prone to bias. Using two or more analysts to code and transcribe data independently and compare notes may increase the approach's validity and reliability.

3.8.2 Data Coding

The researcher transcribed data from audio recordings to textual data before coding. The raw data was coded with the help of Microsoft Office Excel spreadsheet application, where different themes stemming from variables constructed were developed, guided by analytical thinking and thematic mapping. Analytical thinking, according to Babbie (2010:338), refers to the process of transforming collected data into a standardized form using analytical skills.

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Responses to the questions were coded (anonymously by allocating a number to each respondent) and their responses examined, categorized and grouped into meaningful categories. These categories were then used throughout the process of analyzing the data.

3.9 Research Validity and Reliability

The researcher was concerned about the validity and reliability of the whole research process. Throughout the process the researcher was committed to using valid and reliable methods that were time tested and tried. The case study design, for example, is an established qualitative research design; the semi-structured interview approach used in data collection is an established and indispensable qualitative data collection tool. The thematic approach for data analysis is also desirable when conducting qualitative research.

3.10 Summary

The research was a qualitative study. It employed a case study design, used a semi-structured interview data collection tool with literature review in Chapter 2 and used a thematic approach to analyze data. The whole research methodology with procedures to be employed was explained in detail in this chapter. Benefits, weaknesses and limitations, together with ways of going about limitations, were discussed. Results obtained from the field are discussed in detail in the next chapter.

CHAPTER 4 - RESEARCH FINDINGS

4.1 Introduction

This chapter presents the case study data and the analysis based on the objectives of the study and research questions. The research was meant to find out the level of IR implementation in the CUUL university libraries, checking progress, nature of collection and factors for the prevailing situation. It further investigated respondents' knowledge of CUUL and projects spearheaded by CUUL, factors for success or failure of CUUL projects, the role CUUL can play in the successful implementation of IRs in university libraries and the need for a single hosted repository in contrast to individual repositories. Respondents were also required to respond to how CUUL could help individual IRs attain success and the contribution each institution could make towards IR successful implementation in all CUUL member institutions. The researcher briefed respondents about his interpretation of successful IRs. The intention was to initiate discussion and to gain some understanding of the respondent's opinion regarding successful IRs.

From the literature review (see Chapter 2, Section 2.7), the researcher had identified success indicators as presented by Cassella (2010). These included success related to (1) training and growth of IR staff, (2) financial perspectives, (3) internal perspective (annual deposits, number of items deposited daily, full-text documents and articles available, number of active documents and value added services) and (4) success indicators from user perspective. The study also revealed other success indicators summarized into (5) installation of IR software, (6) customization, (7) online access and (8) registering with the Open DOAR. Institutions that had achieved the above eight success indicators were described as successful.

Findings have been thematically presented following major themes from the major research question and sub questions. The research questions were formulated basing on the major research objective of this study.

4.2 Data Analysis and Presentation of Results

There are twenty four (24) public and private university libraries in the Central Region of Uganda that subscribe to CUUL services (Consortium of Uganda University Libraries, 2016). Eight of these were purposively sampled and data gathered using semi-structured interviews. Results are presented in the subsequent sections below.

4.2.1 Results from Section 1: Your Repository (general state of repository)

Some institutions described their IRs as successful because they adhered to only some of the success indicators. The researcher considered institutions that had implemented at least four indicators, that is: i) had installed IR software, ii) had customized it to institutional need, iii) was accessible online and iv) was registered with Open DOAR as successful. This criterion henceforth in this research was referred to as the ***four-tier measure***. The criterion was limited to those four because they basically cover the first phase of IR implementation before populating it. Findings are summarized in table 1 below.

Table 4.6: IR implementation status

Institution	Response from the participant	Researcher's Interpretation of the status quo
1	Had not yet installed IR software but involved in scanning theses and dissertations retrospectively for IR inclusion.	Not yet started
2	IR partially implemented. Had installed IR's software, customized it and was accessible online, although it was shell without content and not registered with Open DOAR.	In progress
3	Had not successfully implemented, had installed DSpace on the library intranet server but not customized yet.	In progress
4	They had successfully implemented their IR; it is accessible online with user statistics, and registered with Open DOAR.	Up and running, online and Registered
5	IR at data entry stage, IR software was installed, customized, and not yet online. They are planning an IR policy alongside data entry.	In progress
6	DSpace IR software was installed, customized and repository could be accessible online, although not yet registered with Open DOAR. With supervision of the digital repository committee, populating the IR was ongoing following the digital policy.	Up and running
7	Had installed the latest version of DSpace IR software, IR was accessible online, populating the IR, but not registered with Open DOAR.	Up and running
8	The institution had installed DSpace IR software, customized it, partially populated it and made it accessible online although it is not yet registered with Open DOAR.	Up and running

In summary, some institutions had not yet embarked on the implementation process (represented as ***Not Yet Started***), while a good number had embarked on the processes and were progressing with their IRs but not yet accessible online (interpreted as ***In Process***). There were also other institutions that had progressed with IR implementation, despite challenges, and had their IRs accessible online (interpreted as ***Up and Running***). Most of those were accessible online although they did not have much content in them. The category identified as ***Up and Running, Online and Registered*** is the one that had their IRs fully implemented and can be described as successful because they had even registered with Open DOAR.

4.2.2 Nature of IR Collection

The nature of collection contributes to the success of IRs in the way that repositories with full text documents attract more hits, searches and downloads compared to those with links. Along with full text documents is hosting a variety of the collection in different formats such as textual documents, audio, audio-visual, graphics and other formats. The empirical study revealed that institutions planned to hold a variety of collections as summarized in the table below.

Table 4.7: The nature of collection in CUUL member institutions' IRs

Nature of Collection	Number of Institutions that includes the format in their collection
Dissertations and theses	8
Conference Proceedings	5
Research Articles	6
Examination Papers	1
Local University Journal	1
Patents	1
Books and Book Chapters	2
Newsletter	1
Technical Reports	1
Special Students' Projects	1

Dissertations and theses, conference proceedings and presentations, peer-reviewed research articles, books and book chapters constitute some of the most common full text documents that form available and planned IRs' collection. Other institutions included newsletters, exam

papers, technical reports, patents, special project reports and local university journals in the IR collection. The nature of the IR collection relates to the core indicator for IR success from the internal perspective discussed in the literature review (see section 2.7.3). The rate of annual deposits, daily deposits, deposited full-text documents and active documents can be determined by the nature of collection of the IR. A wider collection attracts more deposits from different depositors compared to a limited collection. The nature of collection influences the number of deposits and diversity in the collection, although it may affect the quality of the collection, especially where the review process is not very strict.

4.2.3 Factors for Current Status

When asked what factors influenced the "current status" of the repository, participants gave both opportunities and challenges. Although institutions were at different levels of IR implementation, it emerged that they shared common factors for their prevailing situation. The most common factors for prevailing status were categorized into technical skills, institutional support, interest from authors, IR promotion, policy issues, equipment or infrastructure and content acquisition. The table below summarizes some of the factors for the prevailing situation.

Table 4.8: Factors for prevailing status of IRs

Institution	Factors for current status
1	**Opportunity**: willing workers **Challenges**:- i) Lack of technical skills, ii) Lack of infrastructure (like servers) and iii) Lack of policy
2	**Opportunities**:- i) Goodwill from IT technical and library staff, ii) Support from university and library management, iii) Support from CUUL institutions for benchmarking successes, and iv) External funding from EiFL
3	**Opportunities**:- i) Support from library management, ii) Support from CUUL (human resource), and iii) Willing library staff **Challenges**: - i) Lack of technical IR skills, ii) Lack of ICT equipment, and iii) Lack of IR policy.
4	**Opportunities**: - i) Availability of ICT infrastructure (the servers, software and stable internet) and ii) Competent ICT personnel available to manage all ICT related services **Challenges**: - i) Overload of ICT staff with other institutional work.
5	**Opportunity**:- i) Use of consultancy **Challenge**:- i) Lack of technical support

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Institution	Factors for current status
6	**Opportunities**:- i) Will of the library team, ii) Support of management, iii) Available technical team which offers good support, iv) Availability of a research office which mobilizes researchers to publish and v) Availability of a research fund with a condition to publish with IR. **Challenges**: i) Challenged with getting peer-reviewed content to populate IR, and ii) convincing authors to publish with Open Access IR.
7	**Opportunities**: i) Presence of dissertation policy where faculties deposit best dissertations to library, ii) Presence of a systems librarian with IR knowledge, iii) Support from top management, iv) Interoperability with staff system where the IR harvests some resources. **Challenges**: - i) Promotions lacking, ii) Library staff not trained in IR, iii) Slow response to Open Access publishing, iv) Lack of an IR policy.
8	**Opportunities**: i) Available staff: There is an IR manager, ii) Will of the staff to develop an IR, iii) Use of consultancy **Challenge**: - i) Lack of good technical knowledge of DSpace software.

The researcher classified factors that negatively affected IR implementation progress as challenges and others as opportunities. The opportunities as revealed from the empirical study reflect more of the factors why IRs succeed. Again, the study exposed more opportunities than those discussed in the literature review, although some were unique to the institutions. The challenges, on the other hand, directly related to the challenges discussed in the literature review that affect IR implementation (see sections 2.6 and 2.8 respectively).

It appears that lack of technical skills has been one of the major hindrances to IR progress in institutions in Uganda. Out of the eight institutions sampled, only three did not complain about technical skills. Of the three, only one institution had a full-time systems librarian dedicated to library systems, one had their ICT personnel overloaded with other institutional work and the other institution outsourced IR services due to lack of reliable IR technical knowledge. On the other hand, support from the library management, consortium and institutional management played a major role in the successful implementation of the IR.

4.3 Section 2: CUUL's Involvement in the Development of Successful IRs

Section two of the interview schedule sought to establish respondents' knowledge of CUUL as their consortium, their knowledge of CUUL spearheaded projects, their evaluation of CUUL projects, as well as their thoughts about the approach CUUL could employ to help member

institutions establish successful repositories. The section further explored the contribution individual institutions could make towards the successful implementation of IRs in all CUUL member institutions. The researcher also wanted to establish whether respondents' institutions were still active with CUUL and involved in its spearheaded activities. This was aimed at ensuring that only member institutions were interviewed and respondents were aware of CUUL. Findings as presented in table 4 below indicate the responses by the various institutions.

Table 4.9: Familiarity with CUUL

Institution	Familiarity with CUUL	Researcher's interpretation
1	Yes, familiar with CUUL	All respondents were familiar with CUUL. Seven out of the eight respondents have held an office in CUUL, six of whom are currently active office holders. This means respondents understood the purpose of CUUL and are in position to influence decisions in CUUL executive, basing on prevailing needs of member institutions such as the need to have successful IRs in all member institutions.
2	Yes, familiar with CUUL	
3	Yes, familiar with CUUL	
4	Yes, familiar with CUUL	
5	Yes, familiar with CUUL	
6	Yes, familiar with CUUL	
7	Yes, familiar with CUUL	
8	Yes, familiar with CUUL	

4.3.1 Knowledge of CUUL Projects

CUUL was involved in many projects, some of which were sponsored by development partners while others were initiated and sponsored by CUUL itself. The researcher wanted to find out whether members were aware of these projects, if they had benefited from them and their individual evaluation as to whether they were successful, especially the completed/ closed projects. Respondents were also allowed to include ongoing projects and give their evaluation on them, especially those that had run for more than four months. The researcher was interested in finding out why they think they were successful or not, and the yardstick used to measure success. The purpose was to find out if member institutions really understood and involved themselves fully in CUUL spearheaded projects, whether they understood project objectives and if they appreciated the manner in which CUUL managed projects. There was no limit to

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the number of projects a respondent would give. It emerged that there were common projects that were listed as successful. Table 5 below indicates the responses of the most known projects CUUL has spearheaded and the number of respondents who evaluated them as successful.

Table 4.10: Evaluation of existing and completed CUUL projects

Item	CUUL Project	Number of institutions which found project successful	Reasons why the project was seen to be successful
1	Ezproxy (ongoing)	1	It was subscribed to by more than eight institutions
2	Open access advocacy (spider 1 – Closed project)	6	14 institutions in Uganda participated. Spider has embarked on funding Open Access policy development project in Uganda due to the success of the Open Access advocacy project.
3	E-resources (ongoing)	8	It was the first CUUL spearheaded project supported by INASP and PERI. It has been successful because of the pro-activeness of the project leader. She was described as being 'on the ground', approachable and willing to help. However, one respondent observed that the e-resources project was successful in accessibility but usability at institutional level was still lacking.
4	Libhub (closed – Individual participation)	1	It was successful because CUUL was motivated to push projects they led to success by engaging all stakeholders.
6	Open Access policy formulation (Spider 2 – ongoing)	2	It had run for only 6 months and was received well, promising success by project end.
7	Information literacy drives (closed)	1	These were information literacy drives aimed at improving literacy skills of librarians. Librarians were expected to devise ways of sharing the same skills with the patrons. In one institution, information literacy had been formulated into a general course unit facilitated by library staff across all disciplines.

All respondents had an idea about CUUL projects, although it was hard for them to differentiate between CUUL projects and work. Therefore, all work by CUUL was perceived as projects. The study revealed that very few could evaluate CUUL projects as successful or not because they could not recall most of the projects' objectives, including those they fully participated in. So they listed those they thought were successful in their own opinion. Secondly, the researcher found out that project evaluation at individual institutional level was not done for many of CUUL spearheaded projects. This emerged as the most difficult question for the participants and therefore the one respondents answered very poorly. Although respondents gave their opinions here, the researcher was surprised that only one respondent referred to the project documents while answering this question. The rest did not have proper documentation about CUUL projects, especially about objectives, expected outcomes and project appraisal. Respondents therefore used observable attributes to judge success of the projects such as the proactivity of the project coordinator, number of institutions involved and consistency of phases. There was a communication gap in terms of project documentation like project reports, project contracts and assessment/ evaluation for most CUUL spearheaded projects, suggesting that such documents may have been a preserve of the project leaders only.

4.3.2 Reasons for Success of CUUL Projects

The researcher explored if there was a special niche CUUL had explored that led to success of its projects from the member institutions' perspective. Having participated in a project, and having been in position to point out a successful project, it is possible that the respondent is in position to identify a factor identifiable with CUUL that could have led to the success of the project they had identified. Table 6 below presents the perceived reasons why CUUL projects succeed.

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Table 4.6: Reasons Why CUUL Projects Succeed or Fail

Institution	Factors that led to success of CUUL projects	Researcher's Interpretation
1	a) Awareness was created, and b) Training and capacity building done.	CUUL projects are successful because the consortium has ability to train, carry out awareness and work in unity. Its committed membership composed of experienced personnel, strengthened with executive members willing to offer voluntary participation and dedicated service to all CUUL spearheaded projects. CUUL not only forms a strong collective bargain but also a team of competent fundraisers. It also has the ability to monitor and assess project progress since most projects are funded.
2	a) CUUL projects were successful because of the hard work exhibited by consortium leadership, which fosters sharing, unity and togetherness. b) Unity under CUUL creates collective bargaining power. c) The will for voluntary participation by CUUL committee members on any assigned project fostered success.	
3	a) Dedicated service of the coordinators exhibited in constant follow-up on institutions and instantaneous responses to members' challenges.	
4	a) CUUL projects are successful because project leadership are motivated, have the drive to push projects to success.	
5	a) CUUL projects have proactive and willing coordinators to help all stuck institutions. b) Coordinators carried out institutional visits (follow up) to assess use and any challenges faced	The researcher also found out that many of the project reports are not easily accessible, especially for closed projects, which was very unfortunate on part of CUUL.
6	a) Numbers for collective bargaining (about 30 members under University Library category) b) Unity	
7	a) Ability to source funds b) Ability to offer technical assistance c) Ability to share costs for partially funded projects	
8	d) Committed and motivated CUUL Executive	

4.3.3 The Role CUUL Could Play to Successfully Implement IRs among Member Institutions

With question eight of the interview schedule, the researcher wanted to find out the 'real need' for assistance from an institution such as CUUL as this need would shape the role CUUL could

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play to help member institutions implement successful IRs. This stems from the fact that although many institutions were on course to implementing IRs, many had stalled along the way while others had not yet started. The executive of CUUL, well knowing the rationale of IRs in promoting institutional visibility, would be expected to translate into picking interest in assisting member institutions establish successful IRs. Respondents were asked what they think CUUL could contribute towards assisting members implement successful IRs. Table 7 below summarizes the respondents' thoughts about what CUUL could contribute towards successful implementation of IRs in member institutions.

Table 4.7: The role CUUL could play to contribute to successful IRs

Institution	Role CUUL could play to contribute to successful IRs	Researcher's Interpretation
1	It could create awareness and recruit more members to make a bigger impact (bigger numbers equals bigger impact).	University libraries under CUUL appear to lack knowledge of IRs. This necessitates CUUL to recruit widely to create a bigger collective bargaining power on common goods such as costs of international IR experts who are willing to share expertise with Ugandan universities on ways of implementing successful IRs. The study also revealed a need to intensify Open Access awareness, capacity building, develop local IR standards, create an IR team to take on the IR project champions and train them in IR technical skills. These would be effective if CUUL carried out a needs assessment first to establish members' prevailing needs.
2	It could i) Carry out more Open Access awareness, ii) Do capacity building, iii) Develop local IR standards and iv) Create IR project team to spearhead the implementation in all institutions.	
3	The consortium could i) Do trainings and sensitization about IRs, ii) Carry out shared training with successfully implemented IRs for motivation, and iii) Form a team of IR experts to train and help with IRs' technical skilling in institutions that are failing.	
4	Should i) Carry out a survey to find the need at institutional level, ii) Identify key stakeholders in institutions and seek their support and iii) Engage key decision makers in top management and library management level to promote the Open Access agenda.	
5	CUUL could i) Appoint a national IR champion and ii) Train IR champions locally at institutional level.	
6	It could i) Help institutions assess their needs and commitment to have their research accessed internationally, ii) Sensitize librarians about the role of IRs and advantages of Open Access, iii) Engage institutional top management about the rationale for IRs and iv) Train research directors and researchers to appreciate IRs and Open Access.	
7	It could strengthen capacity building and develop local IR standards.	
8	It could offer technical support with IR software.	

4.3.4 CUUL Members' Willingness to Participate in a Single Hosted Repository

Software as a Service (SaaS) is one of the ways consortia and institutions with a common cause can use to approach a challenge for which the solution is software. In regard to IRs being run on a software platform that allows independent operation and shared capability, the researcher sought to find out whether CUUL member institutions were willing to use the same approach to help all members implement successful IRs. Table 8 below gives the responses and reasons for their answers.

Table 4.8: Willingness to Participate in a CUUL Hosted Repository

Institution	Willingness to Participate	Researcher's Interpretation
1	The institute would participate because it appreciated CUUL spearheaded E-Resources project. It would also be willing to collaborate with other institutions under CUUL for a hosted IR.	Institutions were willing to participate in a single CUUL hosted repository. However, they were cautious of the time it would take to implement amidst ongoing individual institutional progress. Consequently, a federated IR in form of a "Union IR" was suggested, such that it harvests from CUUL members' IRs in form of links. Halting prevailing progress and lack of cloud based service providers in Uganda made it impractical at that moment.
2	Supported shared capacity and single hosted repository but cautious about capacity of CUUL to implement the project and opts for CUUL to help individual institutions implement individual IRs.	
3	Did not support a CUUL hosted repository and opted for CUUL helping institutions implement individual IRs due to the difference in decision making in various institutions that may delay others.	
4	They were willing to participate and also willing to share personnel with IR skills.	
5	They are not willing to participate in CUUL hosted IR. They thought their progress would be curtailed.	
6	Supported shared capacity and single hosted repository but a union IR.	
7	Supported shared capacity but cautious about ability of CUUL to raise financial resources to sustain the project and speed for all to cope.	
8	Supported shared capacity and single hosted repository to enable harvesting from the member institution IRs (Union IR).	

4.3.5 Approach to Single Hosted Repository

Barton & Waters (2004:11) suggested a six step approach to implementing a repository service. Not much literature about approaches to establishing IRs at consortia level exists. The researcher therefore sought to establish any approaches CUUL could use to establish successful IRs in its member institutions. The researcher wanted to compare and find out if one of the causes of failure to establish success repositories in Central Uganda relates to lack of knowledge of how to approach establishing an IR, but also member institutions' proposals to developing hosted repository under CUUL. Table 9 below gives a summary of the proposals made.

Table 4.9: Suggested Approach to Single Hosted Repository

Institution	Approach to single IR	Researcher's Interpretation
1	CUUL should, i) Write proposals to source for funding from development partners, ii) Create awareness among members iii) Train staff about IRs.	It is clear there is a need to carry out a survey to assess members' progress and profile IR skill in member institutions. Because developing a federated IR is an expensive venture, CUUL was advised to have a plan for funding the project. This could be achieved through writing proposals to solicit for funds from development partners. All those could progress along with training stakeholders about IRs, what they are and how they operate.
4	CUUL could i) Assess members' prevailing IR progress ii) Search and profile the different skills needed for establishing a successful IR team, iii) Look for financial resources to fund the project and iv) Train many more IR experts.	
7	Could i) Use Spider 2 (ongoing project) to assess institutions and establish the starting point, ii) Profile institutions and establish a center for excellence, iii) Use available human resource for technical support, iv) Develop a sharing forum for IR staff with international experts for best practices.	

4.3.6 Where CUUL Could Start Getting Involved with Individual IRs

CUUL could opt to help member institutions at their various points of need so that they each implement a successful IR individually. The researcher sought to hear about the various approaches CUUL could adopt if it was to explore the option of helping individual institutions from their points of need. This option came about because institutions had approached establishing their IRs in different ways. Some did it in-house, others subcontracted service providers while other institutions used CUUL staff who were willing to offer free technical support. Table 10 below gives the approaches suggested.

Table 4.10: CUUL's starting point to Individual IRs

Institution	CUUL: Suggested starting point
1	No comment
2	CUUL could;- i) Begin with sensitizing members about IRs, what they are, what they do, and how they are populated, managed and sustained. ii) Carry out OA awareness iii) Create an IR team at consortium level to assist all institutions to train others.
3	CUUL could;- i) Profile institutions to identify human resources and ii) Do capacity building.
5	It could appoint a national IR champion with IR expertise who would facilitate training of local IR champions.
6	CUUL could assess and evaluate the prevailing status, based on findings, and develop a team of IR technical personnel to help institutions set up repositories.
7	CUUL could carry out a needs assessment, based on the findings, and develop IR training material and teams to impart skills in member institutions.
8	It would begin with assessing and evaluating prevailing status, and then developing a team of technical persons to help institutions set up individual IRs.

The study revealed that many institutions had embarked on the implementation process. Although this was an optional question and the researcher had not asked respondents who did not qualify to respond to it, many were compelled to comment on it in the transcribed copy sent to them for proofreading. It emerged that CUUL could start getting involved with

individual repositories by first assessing the prevailing situation, creating awareness and sensitizing all stakeholders, especially librarians about the rationale of IRs, as well as setting standards and developing an IR team or IR technical team at consortium level (national champion), which could train other local champions at institutional level. Five out of eight institutions were challenged with issues relating to IR technical skills and knowledge, indicating that it was one of the major challenges many faced.

4.3.7 Institutional Contribution

Participants expressed concern that being a consortium; some institutions could have an edge over others. All members were willing to make other contribution apart from financial, which could be helpful in the successful IR implementation at CUUL level. Table 11 below summarizes the different contribution, other than monetary, institutions were willing to make to support the project.

Table 4.11: Institutional contribution to IR implementation in all CUUL member institutions

Institution	Institutional contribution
1	The institution could offer to host the CUUL hosted repository on their servers and was willing to share costs related to helping it establish a successful IR.
2	Would share experiences for other institutions to develop creative ideas on how to go about developing their own IRs in-house.
3	Because they were struggling, they could forward human resource for capacity building.
4	Given their IR experience, they were willing to share their available IR experts with CUUL member institutions under a cost sharing arrangement.
5	They were willing to work in union to train other members of other institutions, as well as members of our community, in the use of IR and how to populate it.
6	These were willing to offer technical and mentorship support after assessment and establishment of the real need.
7	They were willing to share human resource under a cost sharing arrangement.
8	These would offer training space and case study for IR progress benchmarking.

There was much more that institutions were willing to offer to have successful IRs in CUUL member institutions than what they have contributed to date. Contributions made in kind substantiate the financial contributions. They also make it easier to start the project early.

Because all institutions are faced with budget constraints, some contributions made in kind can be an option. However, much of what is offered here constitutes some of what each institution has for disposal or sharing.

4.4 In Summary

Chapter 4 provided results of the firsthand study. The results were compared to findings in the literature review. It was established that repository managers and staff had varying opinions on what constitutes a successful repository. The literature review indicated that IR success could be measured with the effort institutions invest in training and growth of IR staff, financial contributions, internal perspective (annual deposits, number of items deposited daily, full-text documents and articles available, number of active documents and value added services), and success indicators related to the user perspective. The empirical research identified other success indicators. An institution that had installed the IR software, customized it to its needs, populated it, made it accessible online and registered it with Open DOAR was considered successfully implemented. The study showed that only 12% of the participants met these benchmarks. The biggest proportion of the participants (88%) had not implemented successful IRs; a good number of them were at various stages in the implementation process.

Some of the success indicators and reasons why IRs succeed as discussed in the literature review were echoed in the factors for prevailing status and the nature of collection. Under nature of collection, it was clear all institutions had full-text documents in form of journal articles and dissertations, while others added books and book chapters in their collection. Those that had not started implementing IRs planned to include some of the full-text documents in their collection. Institutions 4 and 6 had user statistics, meaning they could account for use of IR resources. On the other hand, support from top management was reported among the factors that positively contributed to the prevailing status. The major challenge that accounted for the prevailing situation reported by respondents was lack of technical skills. About 75% had been challenged by technical glitches related to IRs. Others issues cited related to lack of ICT equipment, lack of policy, overload of ICT personnel, poor promotion strategy and lack of funds, which negatively affected the progress of IRs.

The study revealed that members were familiar with CUUL but could not clearly differentiate CUUL work from its projects. There was also a gap with evaluation of CUUL spearheaded projects; members could not clearly evaluate project success because many did not have documentation to compare project objectives to realized results.

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Institutions also showed the need to have the IR challenge addressed by CUUL either by putting up a "Union IR" (federated repository) or by helping individual institutions successfully implement theirs. Some members were willing to share their equipment, expertise and time so that all CUUL member institutions gain knowledge about IRs to successfully implement the same in their institutions.

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

I have fought a good fight, I have finished my course, and I have kept the faith. Now there is in store for me the crown of righteousness which the Lord, the righteous Judge, will award to me on that day and not only to me but also to all who have longed for his appearing ~HCSB Bible (2 Timothy 2:7,8)

5.1 Introduction

This chapter presents conclusions arrived at during the course of this research and includes recommendations that could be relevant to CUUL in its endeavor to have all member institutions implement successful IRs.

The study aimed at exploring the state of IRs in the Central Region of Uganda, examining their level of progress, the role CUUL could play to ensure that all member institutions implement successful IRs, and challenges faced by individual institutions in their IR implementation processes. The study also examined CUUL spearheaded projects, the contribution every institution can play in the collective implementation of IRs as CUUL members and where CUUL could come in to assist and salvage the situation. The study further revealed the approach CUUL could use to implement successful IRs in member institutions.

5.2   Guiding Research Questions

The central research question was how could CUUL ensure the implementation of successful IRs that meet international standards in all its member institutions in the Central Region of Uganda?

To achieve the study objectives, the central research question was supported by the following additional questions and the section of the document where they were addressed is provided in brackets.

I.   What does the international literature state as the requirements for successful IR projects?
   a.   What is the international description of IR success? (Refer to section 2.7)
   b.   What factors contributed to success or failure of IRs? (Refer to section 2.8)

II.   How viable is it for CUUL to get involved in the implementation of successful IRs in the Central Region of Uganda?
   a.   What is the general state of IR implementation in the Central Region of Uganda? (Refer to section 4.2.1)
   b.   Are institutions familiar with CUUL activities? (Refer to section 4.3)

      c. How involved are members in CUUL spearheaded projects? (Refer to section 4.3.1)

      d. Do institutions understand why CUUL projects succeed or fail? (Refer to section 4.3.2)

III.   What can CUUL do to help member institutions implement successful repositories?

      a. What other contribution could CUUL make towards realizing successful IRs in member institutions? (Refer to section 4.3.3)

      b. What approach could they use to enable them get involved with member institutions? (Refer to sections 4.3.5 and 4.3.6)

      c. How could member institutions contribute towards successful implementation of IRs in all CUUL institutions? (Refer to sections 4.3.4 and 4.3.7)

These questions were researched comprehensively and Chapters 2 and 4 conveyed the findings, which form the basis for the recommendations. The section bellow gives a brief overview of the most important research findings.

5.3 Most Important Research Findings and Conclusions Reached

In the first instance, the researcher wanted to establish what the general state of IR implementation is in the Central Region of Uganda. Sections 5.3.1 to 5.3.3 below give a short overview of the findings.

5.3.1 IR Success Indicators Versus International Indicators

As presented in Chapter 4 (see section 4.2.1), institutions were classified according to their IR implementation progress level. All institutions which were described as "***Up and Running***" and '***Up and Running, Registered***" had installed the IR software, customized it and could be accessed online. Institutions in this category had an edge over others ("not yet started" and "in progress" categories) and with such edge, some described their progress as successful IR implementation. This was because many IR managers lacked sufficient knowledge of international description of IR success. For example, despite that level of progress, none of the institutions could establish the annual deposits and number of items deposited on a daily basis. Only one institution reported tracking downloads made from the repository. This was a positive stride towards success aimed at establishing the rate of use of IR resources by region and discipline. Unfortunately, it was limited to that. There was no explanation as to how statistics had been used, for example, to influence deposits, garner support from top management or

improve the IR budget. The institution could not even establish the cost per deposit or download for their resources. There were no metrics indicating the depositing level and balance in the collection. It can be concluded that success relating to collecting statistics and using them for effective running of service had not been achieved so far.

Relatedly, in all institutions, none had more than three permanent IR staff dedicated to the service, and on very few occasions did the institutions offer support towards training IR staff in their work. Worse still, other library staff even at the circulation desks did not proficiently know details about their own IR and how it operates, meaning they could not do much to convince patrons about their IRs as a one-stop center for their research needs. This therefore meant promotion of IRs was still lacking in all institutions. The plight placed librarians at the forefront in need of IR knowledge such that they can ably drive the IR campaign. Although some institutions reported financial support from the top institutional management as one of the factors for prevailing success or status, not even one institution had an IR budget detached from the library budget and none had an IR funding model. Only one institution had a preservation strategy while others did not even have an alternative backup plan. Many did not know whether their IRs are interoperable because the majority of the managers experienced technical challenges. It can therefore be concluded that there is no success related to IR staffing and capacity building, IR promotion, financial management and support, IR resources preservation and IR interoperability.

Institutions that were indicated "*In Progress*" were struggling at different levels of success. They had just installed the IR software; some struggling to customize it, others challenged with putting it online, while others had stalled due to technical glitches that had not received immediate solutions from reachable human resources. Those indicated as "*Not Yet Started*" had not yet started on the implementation process because of various reasons, the major one being lack of IR technical skills, even when they confessed having the will to embark on the implementation process. Many institutions in the Central Region of Uganda had not achieved simple milestones such as installation of IR software, customizing it, accessing it online and registering it with Open DOAR. It can therefore be concluded that by all success indicators, majority of institutions in the Central Region of Uganda had not successfully implemented their IRs. Secondly, the four IR success indicators identified in the empirical study relate more to the startup stage of the IR implementation process. International indicators relate more to running and sustaining of the IR service, and somehow ignore successes related to the startup stage, for which IR implementation in Uganda generally is.

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5.3.2 Nature of Collection

The research investigated the nature of collection on two grounds: i) to establish whether repository managers understand the nature, the formats and different types of material that would be contained in an IR, and ii) to explore the depth or richness of the intended or available IR collection. The nature of IR collection determines its success in the way that having full-text documents in the collection and measuring the rate of download indicates IR success internationally. Likewise, the number of authors in position to self-archive their full-text documents with an IR can be perceived as a success indicator. The study established that respondents had a clear understanding of the IR collection (see section 4.2.2). IRs had full-text documents deposited on an irregular basis in many institutions that had operating IRs dominated by theses and dissertations (see Table 4.2). There was little variety in the formats and types of documents deposited. Textual information materials dominated collection in 'up and running' IRs. The researcher concluded that respondents knew the various types of IR documents. However, textual, full-text documents in form of dissertations and theses dominated collection. Other document formats and media had not been exploited. It can therefore be concluded that despite the monotony in the collection, institutions in the Central Region of Uganda had successfully included full-text documents in their collection and a clear understanding of the nature of the IR collection, an international indicator of IR success.

5.3.3 Factors for success/ failure of IRs (factors for prevailing status)

Institutions had challenges in implementing successful IRs in the Central Region of Uganda. Only 12% had successfully implemented IRs following the *four-tier measure*, which was discussed in section 4.2.1. Reasons for the prevailing situation were explored which formed the reasons for success and failure of IRs. Competence with IR technical skills formed the biggest percentage of the factors for success or failure of IR. Only institution 7 had a full-time systems librarian dedicated to library systems only. Institution 4 had its technical staff involved with many other university systems, Institution 2 solicited technical support from the university ICT department to handle all technical issues involved with the IR, two others had one staff each working on IRs and other library services, but majorly learning on job. In the same weight as technical skills was promoting and populating an IR. All institutions that had undertaken to implement IRs had challenges with populating the IR. The institutions with a substantial collection had much of dissertations and theses but greatly came short on other formats and

types. Six respondents agreed that they had not properly promoted the service and Open Access for researchers to appreciate their rationale.

Secondly, policy issues substantially affected IR implementation. Only one institution had their IR policy approved, the rest were operating without any. One institution used a dissertation policy that demands that a copy of students' research be submitted to the library for preservation and inclusion in the IR. The same institution also used the research policy that demands that a copy of any funded research be kept with the library. The rest of the institutions had their IR policies pending approval by university organs. Copyright is one of the policy issues that institutions thought was the most important among the policy issues. Some institutions would not move forward without a comprehensive IR policy or guiding policy fearing legal action that may arise from use of especially students' dissertations without their consent.

The level of support from the top institutional administration was reported by five institutions as contributing to the IR progress. Where the administration was fully supportive, they had the IR developing at a faster rate than where there was little support. Institutional executives make policies and also approve IR funding, lack of which suppresses success. Two institutions reported support from a CUUL member institution in installation of IR software and for benchmarking progress.

Other factors for success included external funding from EiFL, stable internet connectivity, availability of infrastructure, will of library staff to implement the IR, and use of consultancy. The researcher concluded that the major factors that led to successful implementation of IRs that appeared outstanding between them and those in progress were commitment of the IR team, persistent trials, training and use of creative ways to put up IRs despite the many challenges. Almost all university libraries under CUUL, regardless of ownership, face similar challenges and the edge is only realized where there are creative ways to deal with prevailing challenges. From the findings reported above the author concluded the following:

a. The challenges faced in the process of IR implementation in Uganda relate to those faced internationally elsewhere. These are: policy issues, technical issues, IR sustainability issues, IR content scope, institutional support, management costs, internet connectivity and preservation strategies.

b. Successful IR implementation in Uganda greatly depends on the ability of the IR team to develop creative solutions to their challenges. Failure to devise ways out of the challenges means the IR implementation process stalling.

5.3.4 Viability of CUUL Involvement in IR Implementation

The study revealed that respondents were familiar with CUUL and all had participated in CUUL spearheaded projects. Seven of the respondents had worked with its executive and six were still active office holders in various capacities. There was a general awareness of CUUL spearheaded projects limited to the main objective. This manifested clearly in an inability to evaluate projects according to the project documentation but rather using personal opinion. The researcher expected institutions participating in CUUL projects to have appropriate project documentation upon which to base an evaluation of projects' progress. Unfortunately, there were no accessible project documents or assessment reports that participants could make use of. That notwithstanding, participants expressed trust in CUUL to manage projects. This is because CUUL is perceived as having committed leadership who are willing to voluntarily work on projects. CUUL also has the ability to mobilize human resources for capacity building, has the ability to train champions who would train others, promote projects but also monitor, assess and appraise them. The consortium has a membership of over 30 institutions. The consortium (CUUL) was construed as a unity with a will to work together. This argument was mostly based upon CUUL's ability to sustain the electronic resources project for over six consecutive years, giving members access to content that many institutions could not afford individually. The researcher therefore acknowledged that regardless of the few glitches with CUUL managed projects, it could still be trusted to manage and successfully deliver projects to members' satisfaction.

5.3.5 CUUL's Involvement

Consortia could use various approaches to help members establish successful IRs. The study explored two ways, which included the use of (1) Software as a Service (federated IR) and (2) helping individual institutions implement their own. Results indicate that whereas a federated IR was appreciated as a good idea, CUUL members preferred to get help to implement successful IRs in their institutions first. The reasoning was that if member institutions successfully implemented individual IRs, CUUL would easily harvest those for a federated IR. There was also fear with federated IRs that Uganda still lacks capacity to do cloud computing since there are no known service providers here. Institutions were cautious of the ability of

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CUUL to implement this without known service providers and expertise to competently implement this in Uganda. Member institutions thought hiring such services from international service holders would be much more expensive than if there was a local provider. Although a resident or local service provider would be preferred for factors such as technical support and training, SaaS may not require much technical support and training since it is majorly online based and the service provider does the technical work from their hosting site. Fears such as loss of information, problems of hacking and other internet related threats or challenges are handled by the hosting organization.

To ease costs involved, the research sought physical contributions that member institutions were willing to offer to realize successful IR implementation with all members. The fact that members are willing to collaborate – one institution was willing to offer server space, while two others were willing to offer human resource with competent IR knowledge and another offered space for training sessions – allowed the researcher to conclude that they are willing to work together to implement successful IRs in all institutions. Some indicated that they would consider cost sharing if CUUL sourced IR experts. The researcher sees this as a huge step towards attaining successful IRs.

5.3.5.1 CUUL as a Starting Point with a Single Hosted IR (Federated Repository)

Considering the option where CUUL provides a federated repository, a large percentage (88%) of the participants indicated that they had gotten underway with implementing institutional repositories. However, out of that percentage, 38% had repositories up and running, 37% were struggling or stranded, while only 13% had successfully completed their IR implementation. CUUL's starting point would be assessing institutional progress to establish the prevailing need. Based upon the need, CUUL could form a committee in charge of IR promotion and implementation, set standards and requirements, source funds, and lastly source the service providers. If the federated IR is to harvest from member IRs, then technical standards should be matched for compatibility. If the sourcing includes the use of new software, then there should be a plan or compatibility between systems to ease data migration; otherwise, member institutions may resist the project if they perceive it as sabotaging their current progress.

CUUL team should know exactly the kind of service it requires from the hosting organization or service provider. The objectives and ways of implementing the project should be clearly understood by the contractor. Member institutions should be made aware of the project and

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mobilized for support. There should be a plan to sustain it, especially financially. A project monitoring and assessment plan should be put in place to assist members appraise the project. Awareness should entail the benefits of federating IRs with other institutions such as increased accessibility, opportunity for collaborative authorship, cost sharing the hosting fee and developing a corpus of locally generated content at a larger scale, among others.

5.3.5.2 CUUL's Starting Point with Individual Repositories

Considering the option where CUUL helps individual institutions implement an institutional repository per member institution, the starting point may not differ much. Assessing the prevailing situation could be the first step. After establishing the different points of need at each of the institutions, a plan for intensive sensitization could be developed, especially for librarians. Further ideas would be to (1) Profile institutions' capacity from which a team of IR champions could be formed to spearhead the implementation process; (2) Set standards and begin with appropriate training to create local technical champions where they are missing, equipping them with technical skills needed to manage an IR and (3) finally, plan and implement periodical monitoring and assessment.

Developing an online blog where champions could share solutions to raised challenges and would also be helpful, especially where the same software platform is used across the institutions. Capacity building in member institutions should be strongly emphasized in this kind of approach. If members are not trained to solve the challenges they face, the project may be perceived as unsuccessful. Therefore, capacity building should be CUUL's primary objective.

5.4 Recommendations

CUUL should ensure that their projects go through a complete life cycle with transparency. Participants should be informed about the projects' objectives such that they can monitor and assess project results in relation to the set objectives. In order to manage projects efficiently, the project team should decide how management activities of the project are to be handled. The Department for Business Innovations & Skills (2010:5) suggested a life cycle where there is a project brief, project initiation, project progress report, risk register, lessons learned and project review in a systematic way as illustrated below.
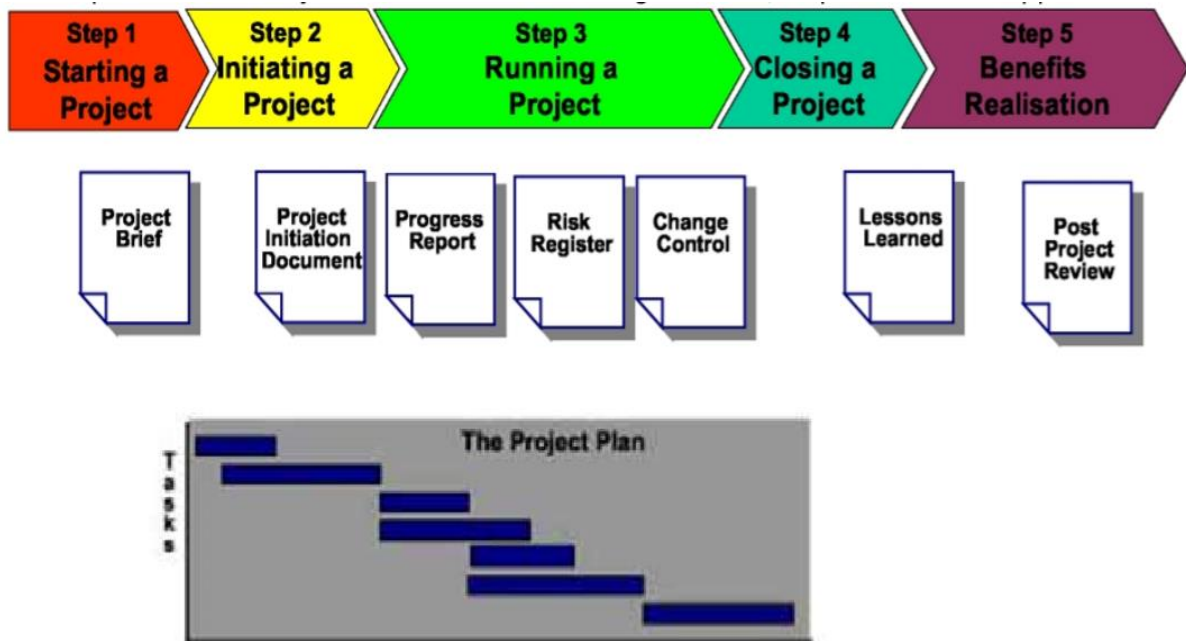
Figure 2: The BIS project life cycle

Source: Department for Business Innovations & Skills (2010:5)

At the start of the project all effort should be devoted to justifying the need for the project, specifying desired outcomes and benefits. While it runs, the team should be occupied with delivering required outcomes and benefits. This also involves managing relationships with key stakeholders, including documenting their understanding of the project. This leads to continuous planning, monitoring and assessment of progress towards the desired benefits.

CUUL should therefore ensure that its project work and the stakeholders progress together throughout. It is very important that stakeholders understand the project so that they can assess it, and that projects run within a given time frame from project start to closure and review. At the closure, benefits should be realized and can be accepted by the stakeholders as real.

For CUUL to implement successful IRs, there is need to start from somewhere. Having evaluated both approaches (refer to sections 5.3.5.1 and 5.3.5.2 above), there is need to take a stand and choose an approach. As was discussed in the previous chapters and report from the empirical study, it is obvious that there is need to help member institutions to implement successful IRs. Without a doubt, CUUL could only assist if its starts with assessing the prevailing situation to establish the starting point. It would then categorize findings in a meaningful manner, according to need. Thereafter, it would decide whether to offer assistance

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according to institutional need or start all over again. It is eminent that from the assessment, institutions would be profiled and human resource identified. This is important in developing solutions to prevailing challenges. Where challenges are similar and recurrent, creating a wiki or blog from which members can share challenges and solutions can be done.

CUUL should pick demonstrated interest in member institutions' IR status. For example, it should set up basic startup standards for institutions to use as benchmarks.

It could use cost sharing to hire renowned local IR experts to help establish IRs in institutions which have not started. This could work in the short run to help stranded institutions and those that have not yet embarked on the implementation process.

In the long run, CUUL should prioritize sensitizing librarians in Uganda to appreciate and adopt the concept of IRs. All librarians should have interest in IRs as much as they do with other information materials in the library. It was shocking, for example, to find that apart from the IR manager and staff, no other library staff was knowledgeable about their own IR in any of institutions identified for participation. This showed how superficial their interest and knowledge was with their own IR. One would not expect that these librarians would be able to promote the IR to patrons as their one stop research center when they did not have appropriate knowledge about it.

General training about the promotion of IRs should be intensified and linked to other institutional policies. For example, promotion of academic staff can be gauged with the applicant's contribution to the IR, rather than recognizing article publications in major discipline journals only. Swan (2012:50) explained that the rector at the University of Liege in Belgium, as a policy, tracks an applicant's publication record for promotion from their IR. Although this is enforceable at institutional level, CUUL can mastermind all member institutions' IR policies such that good policies are not left out.

Promotion is very important in the implementation of successful repositories, more so at consortium level. Namaganda (2012:11) cites Paulos (2008) emphasizing that most successful library institutions are those that had succeeded at making strong alliances. With the trust and benefits realized by institutions working under CUUL, it should be easy for CUUL to lead even in policy formulation issues.

CUUL should encourage librarians to consider funding of IR project work, including them in the budget where it has been ignored. Namaganda (2012:11) explains that librarians need to

prioritize IRs through budgeting and inclusion in the institutional strategic plans. Budgeting IR activities and costing them helps establish cost per deposit or download, which is an essential indicator of IR service success.

CUUL also has the capability to lobby development partners like EiFL and the State for funding of the project. The State could be interested in the project because CUUL has a substantial membership of both public and private institutions.

CUUL should promote research and open access publishing. As was stated in section 2.2.1, one of the primary objectives of post-secondary institutions (since 1810) has been research (Teferra & Altbachl, 2004:37). Research has been a defining element for academic institutions and systems. IRs are fed on institutional research and publications. It is the author's perception that the actual concern for institutions in Uganda is that they are information and knowledge consumers and not producing much themselves. CUUL should help member institutions recover from the poor state of research by facilitating collaborative research and authorship, and at the very least help libraries revitalize their collection through access to recent publications. CUUL should continue facilitating access to knowledge frontiers in form of online journals and databases as a means for undertaking viable research.

CUUL could make use of available opportunities in the effort to implement successful IRs. For example, the University of Pretoria with sponsorship from Carnegie Corporation of New York, from 2010 trained several librarians in Uganda through the Continuous Professional Development (CPD) program and Master of Information Technology (MIT). These two programs have delivered much training in the area of institutional repositories and creative technologies that can be used to enhance research and publication. CUUL could task beneficiaries to champion implementation of such creative ways to have better IR services in all member institutions. The country records over 30 beneficiaries, which is a good number that would make a strong team to start with when implementing innovative technologies, including IR implementation.

5.5   Recommendations for Further Research

There still exists a research gap on IR funding models in developing countries like Uganda. Although funding is a challenge worldwide, institutions in developed countries have developed creative ways of overcoming such challenges. In the developing countries, there is scanty information about funding models for IRs.

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5.6　　In Summary

This chapter has covered the IR success indicators versus international indicators, factors for success or failure of IRs, viability of CUUL involvement in IR implementation, CUUL's involvement, CUUL as a starting point with a single hosted IR (federated repository), CUUL's starting point with individual repositories, recommendations to CUUL and recommendations for further research. The consortium should consider taking up IR implementation as a project; profile institutions, find knowledgeable staff, develop a team of champions at the national level, develop a curriculum of relevant IR skilling, source funding or use cost sharing to train institutions about IRs, what they are, what they can do, their rationale to the whole institutional visibility and how to put up and run a successful IR using creative means. CUUL should not ignore available opportunities in training and should be involved in sourcing more training opportunities in and out of the country for exposure. There should be a demonstrated interest by CUUL in prevailing member needs and a will to help them overcome their challenges. With such an approach, CUUL will not only have successful IRs in its member institutions, but also skilled IR experts that can be shared among institutions and other consortia.

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UNIVERSITY OF PRETORIA
FACULTY OF ENGINEERING, BUILT
ENVIRONMENT AND INFORMATION
TECHNOLOGY
School of Information Technology

SEMI STRUCTURED INTERVIEW GUIDE

Section 1: Your repository

1. In your opinion: Has your institution successfully implemented an Institutional repository (IR)? Please provide a reason for your answer.

2. What is (would have been) the nature of your (IR) collection?

3. What, in your opinion, are the factors that have contributed to your IR's success/failure? (factors for your current IR situation)

Section 2: Involving CUUL in the development of our repositories

I am investigating whether it would be viable to recommend / propose that CUUL assists in the development of the necessary capacity and infrastructure to successfully implement IRs in the Central Region. The next set of questions refers to this recommendation.

4. Are you familiar with CUUL or do I need to explain what CUUL does?

5. Do you know of any other CUUL spearheaded projects? If 'No' proceed to Question 8. If 'Yes' answer the next two questions.

6. Do you know whether these CUUL projects were successful or not? Please explain your answer.

7. In your opinion: What made them successful/unsuccessful?

8. What contribution or what should CUUL do to make sure all member institutions in central Uganda have successful IRs?

9. In your opinion, if you were to recommend that CUUL develops shared capacity and software as a service (a single hosted repository for all of members) – would you be willing to participate? [If 'No' proceed to question 11.]

10. What would be the best approach for CUUL to start establishing such a single IR? [Proceed to question 13.]

11. Would it be better for CUUL to assist in establishing an IR at each of our institutions? Please explain your answer.

12. What would be the best approach for CUUL to start getting involved in the establishment such IRs? (How should CUUL get involved?)

13. In what ways can your institution / library support CUUL in implementing successful institutional repositories in member institutions? *(Examples: share staff with the necessary expertise, contribute funding, host the server where the repository would be developed, host the 'back-up' server.)*

14. Do you have any recommendations for CUUL regarding the implementation of an IR project?

Thank you for participating in this survey.

Appendix II: Informed Consent

UNIVERSITY OF PRETORIA
FACULTY OF ENGINEERING, BUILT
ENVIRONMENT AND INFORMATION
TECHNOLOGY
School of Information Technology

INFORMED CONSENT

Dear respondent,

I am Naphtali Happy Kuteesa a student of MIT, at the University of Pretoria, South Africa. I am conducting research with the title: "An investigation into the role CUUL can play in the implementation of successful Institutional Repositories in Central Region Uganda." The main objective of the study is to establish factors that influence the success or failure of institutional repository (IR) projects and to recommend how CUUL can actively participate in establishing successful Institutional repositories in all her member institutions in Central Uganda.

You have been identified and selected to participate in this investigation because your institution is a member of CUUL and has benefited from some projects spearheaded by CUUL.

There are no personal risks involved. Your participation in the study is voluntary, you are free to participate and leave anytime you wish to do so. All data shall be anonymized before use. The results will only be used for academic purposes and may be published in an academic article.

(If you agree to share your opinion in this study, kindly indicate your name and sign in the spaces below)

Your Name: ………………………………………………………………………………

Your signature: ………………………………..   Date:………………………………..

Appendix III: Letter of ethical clearance

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Enquiries	:	Dr Marlene Holmner	**Faculty of Engineering, Built**
Tel. nr.	:	+27 (0)12 420-5215	**Environment and Information**
Fax nr.	:	+27 (0)12 362-5181	**Technology**
E-mail	:	marlene.holmner@up.ac.za	
Office	:	IT 6-43	**School of Information Technology**

2016-09-01

ETHICAL CLEARANCE FOR HAPPY KUTEESA

Dissertation Title: *An Investigation into the role that CUUL can play in the development of successful Institutional Repositories in member institutions in Central Region of Uganda.*
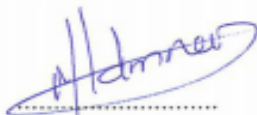
To whom it may concern:

This is to confirm that the Research Committee of the Department of Information Science approved the application by Happy Kuteesa for ethical clearance. Mr Kuteesa complied with the standard requirements for ethical clearance as set out by the University of Pretoria's Faculty of Engineering, Built Environment and Information Technology (EBIT), as follows:

- He signed and submitted all the application forms required for ethical clearance;
- He submitted his data collection instruments for vetting by both the Research and Ethics Committees; and
- He implemented all corrections recommended by the above-mentioned committees.

The Research Committee of the Department of Information Science therefore requests permission for Mr Kuteesa to collect the data he needs in order to complete and submit his mini-dissertation for examination. The Committee further appreciates any effort by appropriate authorities to expedite this process, and expresses its gratitude in anticipation.

Yours sincerely

Dr Marlene Holmner

Dr Marlene Holmner
Academic Coordinator: Carnegie MIT
Department of Information Science
E-mail: marlene.holmner@up.ac.za