Investigating the Feasibility of Using Subject Institutional Repositories: A Case Study at the University of Zambia

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ABSTRACT

This study investigates the feasibility of using the subject institutional repository. It seeks to quantify the research footprint of The University of Zambia as depicted on the Institutional Repository, to establish workflows used when depositing (ingesting) content into the repository, to identify an appropriate open source software tool for setting up a subject Institutional Repository and to assess the usability, usefulness and feasibility of a subject Institutional Repository. The research used a case study, it used purposive and random sampling. The research instrument used were questionnaires and interview guides, the research used system usability scale SUS in order to measure the usability of the subject repositories. The study revealed that the existing institutional repository is not utilized fully. This was evidently shown by the state of its current footprint. Scholars of the institution do not upload their scholarly work on the repository. The research further revealed that Dspace is the most recommended open source software tool to be used when setting up the subject institutional repository. It further discovered that there are a number of procedures followed when uploading materials on the repository. Furthermore, the study found that it is feasible to use the subject institutional repository as the majority of the participants demonstrated a favorable disposition towards the repository that was set. It was concluded that to use the subject institutional repository at the University of Zambia is possible. The results of the research is showing such possibilities by first quantifying the research footprint of the UNZA Institutional Repository. The study recommends that, as regards to copyright issues, authors should be educated on their rights in relation to their intellectual output. Further, schools have to purchase enough scanning machines so as make the scanning process of documents easier. It also recommended that the subject institutional repositories that will be set should use Dspace software tool and it should be structured in such a way that the search and retrieval of materials is easy.

Keywords

Institutional Repository, Subject Institutional Repository, Dspace.

1   INTRODUCTION

Academic and research institutions in many developing countries like Zambia are still battling to overcome many challenging issues in an attempt to make their research outputs openly accessible by means of Institutional and Subject Repositories. Research is made compulsory for both lecturers and students either by job description or by prescribed academic program of study (Egwunyenga, 2008). Reasonably, these research outputs should be given wide circulation so that the results of the research can be applied in addressing the issues that they sought to tackle and used for further research, but unfortunately these outputs reside in obscurity where they are not visible to those who may need them, gathering dusts in the various departmental offices and institutional libraries without getting published. Some eventually get published in local journals that have minimal circulation due to poor distributorship, marketing or prestige. Thus, after so much painstaking commitment of efforts and resources in undertaking researches, the outcomes are not widely disseminated. Consequently, these research findings die at the institutional level as those who need to apply the knowledge are unable to access them. This situation thus highlights the need for an effective process of knowledge dissemination from academic and research institutions in developing country.

An Institutional Repository is a digital archive of the intellectual product created by the faculty, research staff, and students of an institution and accessible to end users both within and outside of the institution, with few if any barriers to access (Chawner, 2010). Therefore, Institutional Repositories can provide an immediate and valuable complement to the existing scholarly publishing model, while stimulating innovation in a new disaggregated publishing structure that will evolve and improve over time. An Institution Repository helps to enhance an institution's prestige or visibility and it is there to maintain control over institution's intellectual property and encourage open access. Further, they build on a growing grassroots faculty practice of self-posting research online. Subject Repositories are slightly different. They are not restricted to any one institution for their input, in some cases taking on a global mantle. Though not always the case, there is more of a 'buy in' from the relevant community. But more generally, they adopt a policy of seeking to provide a comprehensive collection of freely accessible material relevant to a particular subject or research-focused discipline (Lynch, 2003).

1.1 Background of the study

The University of Zambia Library was established in 1966 and officially opened in August 1969 by the first Republican President, Dr. Kenneth D. Kaunda. The building which was designed to hold 300,000 volumes and seat 1,650 readers is a fine example of modern architecture. At the center of its activities, the Library's vision is to have in place a conducive environment appropriate to providing an efficient, timely and user-tailored service (Kakana and Makondo, 2014).

In the course of time, the University of Zambia through the Library envisaged an idea of establishing the Institutional Repository which will hold the scholarly output of the institution. Hence considering the benefits that an institutional repository provides in a learning environment, stimulated the need for setting up an institutional repository at the University of Zambia Library in June 2010. Apart from digitizing, archiving and making visible globally the research output of the University of Zambia, the Institutional Repository at UNZA was also mandated to facilitate the teaching process through the preservation of learning materials in digital format for e-learning. UNZA started implementing the digitization process of its unpublished theses and dissertations in June 2010. This was after UNZA staff from the Centre for Information and Communication Technologies (CICT) and Library underwent training in various aspects of implementing the Institutional Repository in the Netherlands under the sponsorship of the Netherlands Universities Foundation for International Cooperation (NUFFIC). Thereafter, considering the increase of the enrolment of the student, the institution now envisages to make all the schools of the institution into the colleges. This idea calls for scholarly output of the institution to increase which implies the need to adequately use the subject repository for each of the sub-colleges. (Kakana and Makondo, 2014).

1.2 Statement of the problem

Many higher learning institutions have established Institutional Repositories with the primary mission of collecting, preserving and disseminating scholarly research output. The University of Zambia (UNZA) is such an example, the higher learning institution established an Institutional Repository (IR) in order to archive and make available to the research community the university's intellectual output, the university has 157 degree and postgraduate programs, 10 faculties, over 879 academic staff and 30,000 administered students (post graduate and undergraduate students) but yet the scholarly output archived on the repository is not any close to these figures or the

expected content it should have , with about 30,000 administered students the repository records only 4,182 (undergraduate and graduate) student scholarly research, dissertation and thesis output. This is because there is no decentralization of the tedious work of scholarly ingestion or archiving. The work of the institutional repository administrators is not delegated among the schools of the institution. The subject institutional repository can potentially allow for the necessary delegation of the work because it will promote self-archiving. (Kakana, and Makondo, 2014). Therefore, this research aimed at investigating the feasibility of using subject institutional repositories at the University of Zambia.

1.3 Research objective

The general objective of this research was to investigate the feasibility of using subject institutional repository at the University of Zambia.

1.3.1 Specific objectives

The following research objectives that were developed to guide this study included:

1. To quantify the research footprint of The University of Zambia as depicted on the Institutional Repository.
2. To establish workflows used when depositing (ingesting) content into the repository.
3. To identify an appropriate open source software tool for setting up a subject Institutional Repository.
4. To assess the usability, usefulness and feasibility of a subject Institutional Repository.

1.3.2 Research questions

The research questions where derived from the above objectives. They gave a guide of the needed necessary information to acquire and accomplish the aim of the research. The research questions included the following:

1. What is the current research footprint in regards to scholarly research output uploaded on University of Zambia's Institutional Repository?
2. What workflows are used when depositing content into the repository?
3. Which open source repository software tool is appropriate for setting up a subject Institutional Repository?

4. Is it feasible to set up subject Institutional Repositories at The University of Zambia?

1.4 Rationale of the study

Institutional Repositories (IR) bring many benefits to the institutions that own them, and these benefits are so important now in the digital age that they even affect global university rankings including the University of Zambia (Lynch, 2003). Thus, having in mind that the University of Zambia have a number of individual schools soon to be colleges, uploading the work output of each of these school's will enable them to be recognized at an institutional level as well as international level. In addition, the uploaded work output of an institutional will ensure the preservation of vital scholarly researches of an institutional. An institutional repository with a lot of scholarly researches will enhance the usage of research materials thereby increasing the academia and insight of an institutional as a whole. Moreover, having an Institutional Repository that is consistently uploading scholarly work output of its members will enhance collaboration with other institutions which enables the sharing of research materials locally and internationally. Hence, the research will result in benefiting the members of the university institution to be motivated in persevering in their scholarly researches as they realize that their work will be recognized when uploaded in an Institutional Repository. And consequently, more research outputs of fourth year students, post graduates, lecturers and other researchers of the country will be uploaded and preserved in an Institution Repository.

1.5 Ethical considerations

During the research, the researchers will ensure to follow all the necessary ethical considerations. Hence, the risks and benefits to participate in the study will be clearly be explained to all the participants. The participants will be made to understand that there will be no physical, psychological, social or professional risks associated with their participating in the study. The researchers will uphold the confidentiality of all the participants. The records of the study will be kept private. In any sort of report that might be published, the researchers will not include any information that will make it possible to identify a participant. Research records will be stored securely and only researchers will have access to them. Participation in the study will be voluntary. The decision of the participants to participate or not will not affect their current or future social professional security in the institution. If they decide to participate, they will be free to not answer any question or withdraw at any time without forcing them (Rogelberg, 2002).

1.6 Definition of key terms

Institutional Repository: Sawant (2011) defines an Institutional Repository as an online locus for collecting preserving and disseminating, in digital form the intellectual output of an institution particularly a research institution. For a university this would include materials such as research journal articles, peer reviews, and digital versions of thesis and dissertations.

Subject Repository: is an online archive containing works or data associated with these works of scholars in a particular subject area. Disciplinary repositories can accept work from scholars from any institution (Lynch, 2003).

1.6 Summary

This section discussed the background of the study. This included the purpose of Institutional Repositories and subject Repositories. The section also illustrated the problem that led to the researchers undertaking this study. With regard to the stated problem, the study formulated objectives and research questions that guided the researcher. Also discussed in this section is the significance of the study and definition of key terms which lead the study to the next section which discussed empirical studies on the institutional repositories.

2 LITERATURE REVIEW

2.1 Institutional Repositories

Institutional Repositories are the latest development in a series of systems aimed at managing digital content at many colleges and universities. The concept of capturing and making available the research outputs of an institution and other relevant documents locally to the users of the particular institution through intranet and globally through internet is institutional repository. An Institutional Repository might include electronic versions of documents such as research papers, project reports, patents, theses and dissertations. It may also include many of the digital assets generated by an institution such as working papers, lectures, conference proceedings, learning objects, administrative documents, course notes, etc. The learning objects may include among others study materials, assignments, question papers, audio-video materials and multimedia presentations such as interactive e-learning modules. According to Lynch (2003), a university based institutional repository is a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members. Further, an IR can be defined as a digital archive of the intellectual product created by the faculty, research staff, and students of an institution and accessible to end users both within and outside of the institution, with few if any barriers to access (Crow, 2003). Institutional Repositories manage and create supporting services to store, preserve, and disseminate an organization's digital information or knowledge assets created by faculty, research staff, and students.

Subject Repositories (SRs) as subsets of IRs are online archives containing works or data associated with the works of scholars in a particular subject area. Subject Repositories can accept work from scholars from any institution. A SR shares the roles of collecting, disseminating, and archiving work with other repositories, but is focused on a particular subject area. These collections can include academic and research papers. SRs can acquire their content in many ways which includes author or institutional submission. Crow, (2003) further finds that a SR generally covers one broad based discipline, with contributors from many different institutions supported by a variety of funders; the repositories themselves are likely to be funded from one or more sources within the subject community. Depositing of material in subject repository is sometimes mandated

by research funders. Subject repositories can also act as stores of data related to a particular subject, allowing documents along with data associated with that work to be stored in the repository.

In 2002, the history of the IRs received a further boost with the publication by Crow, senior consultant for the Scholarly Publishing and Academic Resources Coalition (SPARC) based in Washington, D.C., of a ground-breaking paper titled "The Case for Institutional Repositories," (Adetunji et al, 2017). In it, Crow made the important point that, in addition to academic and scientific institutions, non-academic institutions such as governments might benefit from the maintenance of institutional repositories. Recent literature on institutional repositories indicates that repositories are being implemented at a growing rate. A 2005 survey of United States institutions, for example, observed that 40% had already established IRs (Adetunji, 2017).

2.2 Importance of Institutional Repositories

Institutional Repository is the exhibition of an institution to the world, where institution displays its valuable research programs, projects, and initiatives to the world. An institution outreaches its findings that in turn encourage other institutions and organizations to collaborate and to share their knowledge, expertise and skills. An Institutional Repository offers seamless access to documents that reflect past and present research interests of the institution as well as its future research goals. It makes the publications more usable by contemporary and future scholars as well as other professionals like policy makers and social workers, and the pace of scholarly communication would be highly accelerated if the IR holds, among other things; research papers, research reports, as soon they are made public (Crow, 2004). This also helps publications in receiving more citations, since the research findings are quickly available to the fellow scholars.

Through IRs academic institutions across the world will gain from a more efficient and cost effective system of scholarly communication. Establishing an IR also enables a university to publicize its research and teaching programs by enabling access to the work of its staff and students. The quality of a university's academic output forms an effective advertisement for the institution. (Bailey, 2005a) states that many universities also have record-keeping offices to maintain control over the vast amount of paper produced by committees and departments. An IR can be an effective way of storing and making these documents accessible to authorized users. Although universities may see their own interests best-served by making as much content as possible available on open access, there may be some material to which a university may wish to

restrict access to specified groups of users. The material to which a university might restrict access is likely to be material created and intended for internal use or that is not ready for general release.

Johnson (Johnson, 2002) states that one of the essentials of institutional repository is to increase the visibility of the institution`s scholarly work by making them available online. One of the criteria used to rank the universities is the availability of scholarly research online. IR is a better strategy of showcasing what the institution has when compared to institution`s website and departmental websites (Johnson, 2002). IR does not only benefit the institutions by showcasing the research results, it also serves as a way of providing management and preservation of research output (Bailey, 2005).

IR does not only increase the visibility of the institution but also increases the visibility of academic authors; their work will receive more citation because they will be publicly accessible online. Researchers benefit from the impact of their scholarly work, but not in monetary terms. They want to reach out to their peers who will in turn read, use, comment, acknowledge and build upon their work (Jones, Andrew and MacColl, 2006). Open access IR is the best tool to increase the visibility of the researchers when compared to traditional journals which are more limited in its possible impact. Unlike open access repositories, traditional journals are not available to everyone.

The University Of Zambia (UNZA) being an institution mandated to create knowledge through conducting research, has developed a research policy to promote research dissemination in many ways including, establishing mechanisms for data processing, information storage and retrieval systems and ensure that the creative research outputs are reviewed and communicated widely (Kakana and Makondo, 2014). The University of Zambia Library has since taken up the challenge to establish and implement an Institutional Repository that will help to fulfil the implementation of knowledge creation.

2.3 Free and Open Source Repository Software Tools

There are a number of Free and Open-source repository software tools that can be used to implement IRs. These software tools have common features, they are generally have varying requirements and are used in different domains. DSpace, Eprints, Greenstone, CDSWare, Fedora Commons, and i-Tor are among the most popular repository software tools. (Deka, 2006).

2.3.1 DSpace

DSpace was expressly created as a digital repository to capture the intellectual output of multidisciplinary research organizations. It integrates a user community orientation into the system's structure. This design supports the participation of the schools, departments, research centers, and other units typical of a large research institution (Crow, 2004). As the requirements of these communities might vary, DSpace allows the workflow and other policy-related aspects of the system to be customized to serve the content, authorization, and intellectual property issues of each. Supporting this type of distributed content administration, coupled with integrated tools to support digital preservation planning, makes DSpace well suited to the realities of managing a repository in a large institutional setting. Crow (2004) wrote that DSpace software is easy to install. Further, he explained that DSpace allows deposit of digital content and metadata into the repository by users (researchers or librarians on their behalf); this is done by following an approved workflow indicating the policies for reviewing, and approval of the material to be lodged for submission. Additionally, he founded that because of the fat that DSpace allows a wide range of digital material types, it has been adopted by many institutions including Victoria University.

2.3.2 Eprints

The Eprints software has the largest and most broadly distributed installed base of any of the repository software systems (Crow, 2004). Eprints' worldwide installed base affords an extensive support network for new implementations. The size of the installed base for Eprints suggests that an institution can get it up and running relatively quickly and with a minimum of technical expertise. The number of Eprints installations that have augmented the system's baseline capabilities, for example, by integrating advanced search, extended metadata, and other features indicates that the system can be readily modified to meet local requirements. Further, Eprints provides a free web interface for managing, submitting and downloading documents. Due to this flexibility, EPrints have been adopted a number of Australian academic's libraries including the University of Melbourne (Tramboo et al, 2012).

2.3.3 Greenstone

Greenstone provides a flexible way of organizing information and publishing it on the Internet in the form of a fully-searchable, metadata-driven digital library. Using it, a rich set of different types

of collections can be formed that reflect the nature of the source documents and metadata available (Tramboo et al, 2012). Deridder (2004) explains that, greenstone's aim is to empower users, particularly in universities, libraries, and other public service institutions throughout the world, to build their own digital library collections in the fields of education, science and culture, therefore this can be best for establishing subject Institutional Repository.

2.3.4 CDSware

CDSware was designed to accommodate the content submission, quality control, and dissemination requirements of multiple research units. Therefore, the system supports multiple workflow processes and multiple collections within a community. The service also includes customization features, including private and public baskets or folders and personalized email alerts. CDSware was built to handle very large repositories holding disparate types of materials, including multimedia content catalogues, museum object descriptions, and confidential and public sets of documents (Crow, 2004).

2.3.5 Fedora Commons

The Fedora digital object repository management system is based on the Flexible Extensible Digital Object and Repository Architecture (Fedora). The system is designed to be a foundation upon which full-featured institutional repositories and other interoperable web based digital libraries can be built. It supports repositories that range in complexity from simple implementations that use the service's "out-of-the-box" defaults to highly customize and full featured distributed digital repositories (Crow 2004). Bankier and Gleason (Bankier and Gleason, 2014) emphasized that Fedora is the best software on which an IR can be built. They further stated that fedora is powerful digital object that supports multiple views of each digital object and the relationships among digital objects.

2.4 Summary

This chapter has discussed what IRs are. It has discussed the importance of IRs latching to that on the ways an institution can enable the feasibility of using a subject repository and the most popular software tools that are used to build IRs.

3 METHODOLOGY

3.1 Introduction

This chapter describes the methods that were used to carry out the research. It specified the methods that were used to accomplish each objective. The methodology showed how research footprint, the setup and configuration, as well as usability and feasibility will be sought and carried out in order to achieve the research objectives.

3.2 Research Design

The research used a case study research design. This design was suitable for the research because it applies a variety of methodologies and relies on a variety of sources to investigate a problem and in this case methods such as interviews and questionnaires were used. The design is useful for research when not much is known about an issue or phenomena. In this research, the feasibility and usability of setting up a subject repository is not known. Therefore, this design enabled researchers to find out what is not known about the matter which helped in achieving the specific objectives. This is because the case study is an in-depth and detailed examination of the subject of the study.

3.3 Research Footprint

Digital content of the UNZA IR was harvested and analysed. This helped to find out the current research footprint in regards to scholarly output uploaded on the UNZA IR.

3.4 Existing Ingestion Workflow

To find out the workflow for ingesting or depositing content into the repository, a members of staff from the special collection of the library was interviewed. The interview guide (see appendix 3a) was used to facilitate interview. The information that was solicited for during the interview was recorded, and later was transcribed. This provided a research with knowledge on the procedures that are under taken in order for the scholars to upload their resource material on the IR. This helped to provide a credible case or reason as to why the proposed method of using the subject institutional repository might be helpful as compared to the IR.

3.5 Repository Setup and Configuration

The repository setup and configuration enabled the study to achieve the hallmark objective of the whole research. The interview method was used to identify on ways of how to set up and configure the IR. The key stakeholders that are responsible in the day to day running of the repository were interviewed. These were members of staff from the UNZA Centre for Information and Communication Technologies (CICT). Interview session was guided by the interview guide (see appendix 3b). This method made it possible to find out the suitable Open Source Institutional Repository Software Tool to be used in setting up the subject institutional repository. The members of staff were interviewed based on their preferences, knowledge and skills of various software tools. Therefore, this enabled to identify the software tool that was used to set up the subject institutional repository.

3.6 Subject Repository Usability

The system usability scale (SUS) was used to assess the usability and feasibility of the subject institution repository that was set up. This data collection instrument has a five Likert Scale (from strongly disagree to strongly agree) against each of the 10 statement (five negative and five positive statements) about the subject institutional repository. The users were to agree or disagree to some extent to each statement. The SUS questionnaire was suitable for the objective of the research 'usability of the subject institutional repository' to be achieved. This is because it was possible to measure the usability of the system by using a systematic standardised method of calculating the SUS scores of each respondent. Each score is regarded as the grade that a respondent has assigned to the system and it ranges from zero to hundred (0-100). These scores are used for suitable statistical calculations which helps to know the state of the system as to whether it is good or not (Usabilitynet.org).

3.7 Study Context and Target Population

The target population of this research included fourth year students from the school of education. The study targeted fourth year students because it is the institutional requirement for them to write project reports, hence in good position to participate in achieving the fourth objective, through uploading their reports on the created subject institutional repository. From the total population, forty (40) students were targeted as the sample size of the research. This sample was selected to

participate in the research by making them use the subject institutional repository which was set up. This was to make them have experience in using the subject institutional repository.

3.8 Sampling Procedures

The study used purposive sampling in the selection of the participants from the Library and CICT. Maykut and Morehouse (1995) argue that purposive sampling helps qualitative researchers to gain a deep understanding of phenomena experienced by a carefully selected group of people. Purposive sampling therefore implies that participants that are selected to take part in the study ought to be relevant in relation to the subject matter under inquiry which is the Institutional Repository in this case. The careful and deliberate choice of informants who were relevant to the research objectives were selected. Apart from purposive sampling the study also employed random sampling to select the fourth year students from the school of education. Random sampling was suitable here to give equal chance of being selected (so as to avoid biasness).

3.9 Data Collection Instruments

The study used an interview schedule for the collection of data that was later analyzed and interpreted. The schedule was used by the researcher, who filled in the questions with the answers received during the actual interview. Further, interview schedule was used because it increases the likelihood of collecting accurate information or data, allows researchers to get more information, increase's the rate and amount of responses (Yin, 2003). The interview guide document is attached to the appendix (3) of this research. The study also used system usability scale (SUS). This instrument is a Likert Scale which includes 10 questions which users of the institutional repository were made to answer. These enabled the participants to rank each question from 1 to 5 based on how much they agreed or disagreed with the statement. The instrument is suitable because of some aforementioned reasons in the preceding paragraph. The SUS questionnaire document is attached to the appendix (4) of this research.

3.10 Data Analysis

The research used Microsoft excel as the data analysis tool. The most basic advantage to use of Microsoft Excel for data analysis is that it helps to order the results. This type of a technique is used when large quantity of data is being handled. It analyses the results and rates the answers depending on the fixed parameters that have been defined earlier by the user. The data

representation graphical such as the bar charts were used to represent the data in a clear and simple way.

4 RESULTS

4.1 Repository Content Analysis

The statistical count of scholarly output on the Institutional Repository shows that there was an increase in the number of materials uploaded per year from the year 2010 to 2013. Surprisingly, from the year 2014 till date the repository has recorded very small figures in terms of material uploads per year. As detailed in the bar chart below, it can be seen for example how the number of uploads of scholarly output on the repository decreased from 1122 (in 2014) to 358 (in 2014).
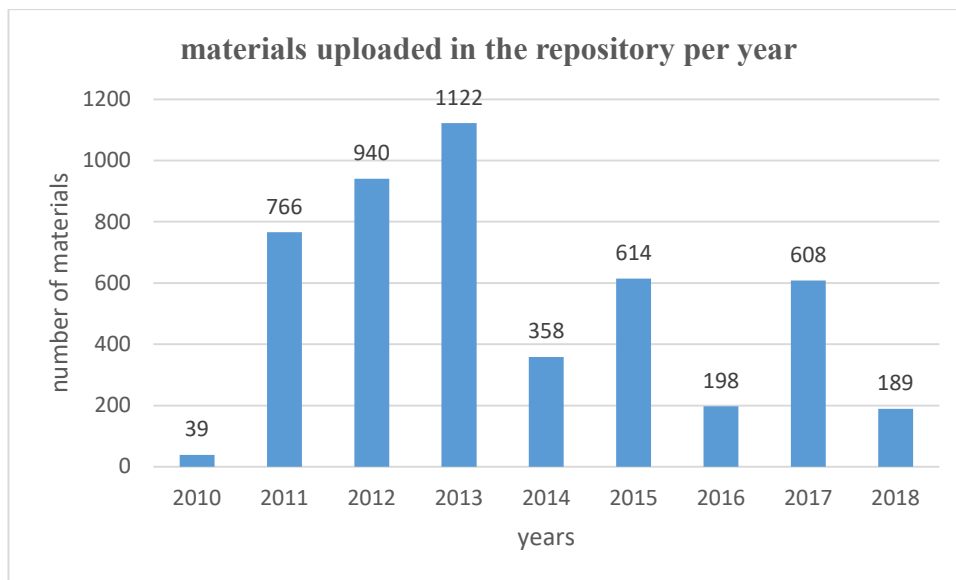

Figure 1: Number of materials uploaded on the repository from 2010 to 2018 by year

In addition, the statistical count shows that the school of Education has a low count of materials uploaded on the repository. Despite being the biggest (highly populated) school at the university, the school of Education has recorded only 705 uploads from 2010 till date. This has brought about a concern among the current researchers as to why some schools have recorded lower numbers of material uploads in each year even when they have higher enrolment rates in the university. The pie chart below shows the total number of materials that each school has uploaded per year from 2010 till date.
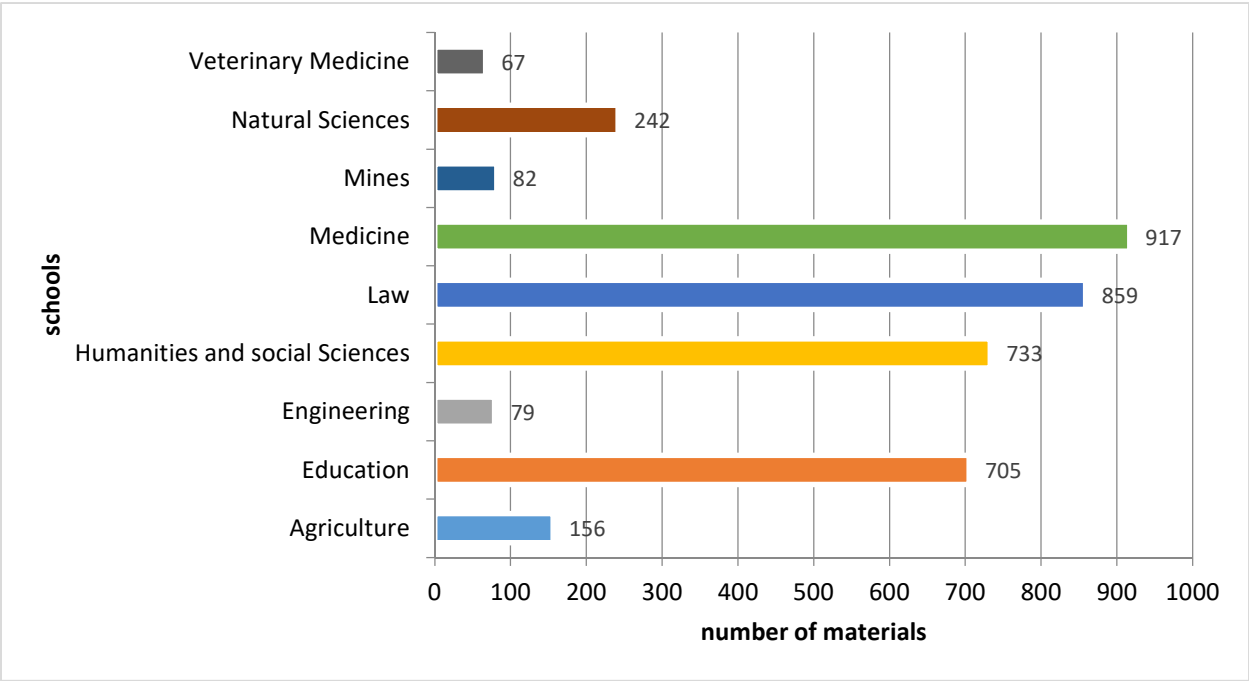
Figure 2: *Number of materials uploaded on the repository by each school from 2010 till date.*

Of interest, the researchers considered how each department in the school of education has been uploading materials on the IR from the year 2010 to date. As shown in the bar chart below, the figures depicts that the highest number of uploads of the materials in the school of education comes from the department of library and information science as well as the department of languages and literature (with 20 uploads each). However, this is not agreeable considering the fact that the figures are too low in line with the number of staffs in each department.
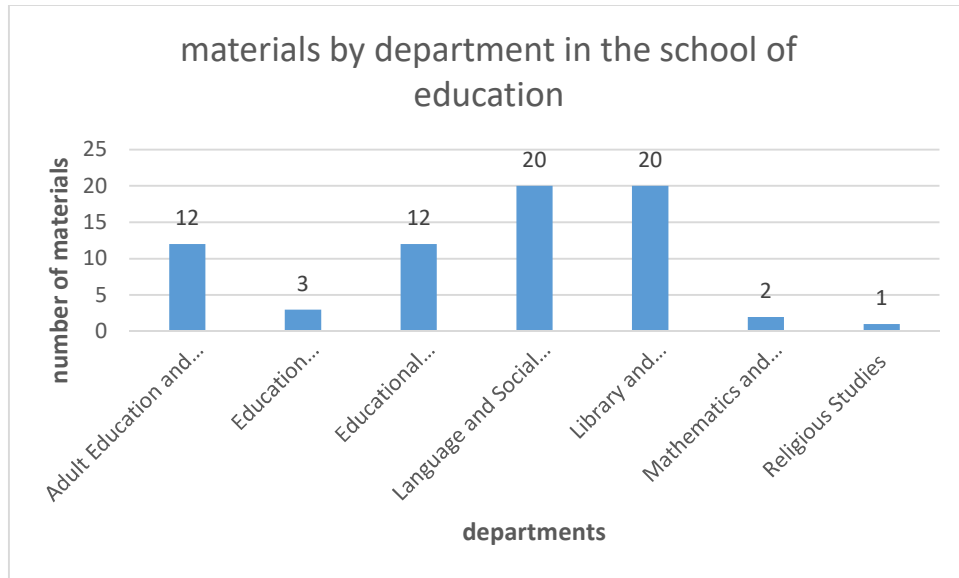
Figure 3: Number of materials uploaded by each department in the school of education.

According to the students report upload on the institutional repository, the highest upload was in the year 2013 (574 materials) from the time the repository came into effect. From the year 2013, the number of upload drastically dropped and this result is unbecoming of the institution that just established the institutional repository.

Figure 4: The number of students project materials uploaded per year.

4.2 Existing IR Workflows

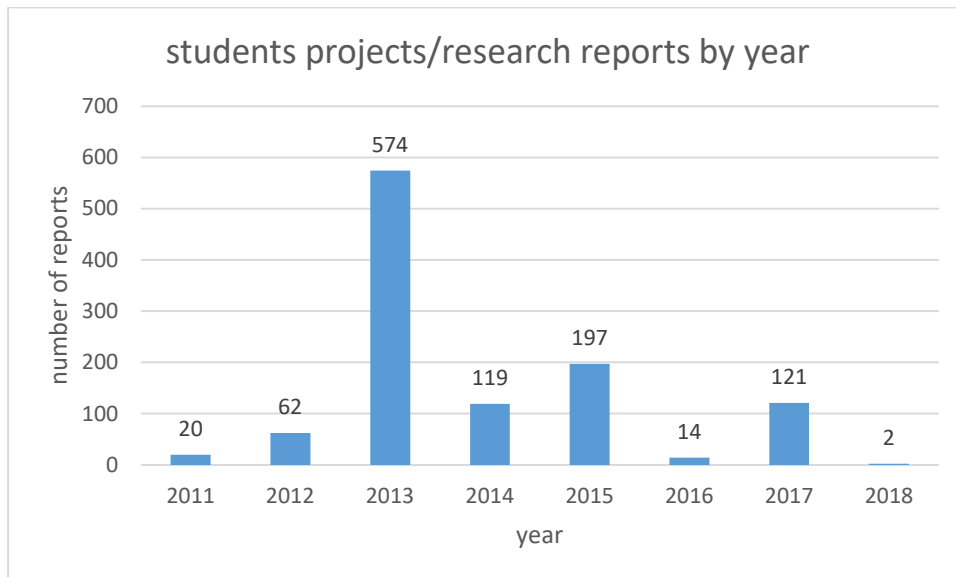To deposit the material in the IR, procedures are followed. Researchers interviewed the library administrator from the special collection of the University of Zambia main library about the procedures that are involved. It was found that procedures involved includes, peer reviewing, scanning and digitalizing, cataloguing, and lastly review and approval of the metadata of the material.

Under Peer reviewing, the material is subjected to the scrutiny of others who are experts in the field or subject of the document. A paper presentation describing the material is prepared and is included in conference proceedings. The author is made to present their work at the UNZA post graduate seminar so that the value of the material is critically examined. The peer review helps the publisher (that is, the editor-in-chief of the UNZA Press and the program committee) decide whether the work should be accepted, considered acceptable with revisions, or rejected. Peer review methods are employed to maintain standards of quality, improve performance, and provide credibility. Peer review is often used to determine a material's suitability for publication.

According to the interviewee, when the document is judged fit for publishing, the library requests both a hard and electronic copy of the material so as to be archived on the IR. If the material has no electronic copy, the material is digitalized through scanners. The scanning process involves Converting a document into electronic documents. The process is quite simple in that paper documents are passed through a scanning device that converts the paper document into an image. The images are then manipulated into text and data that can be read using ICR (intelligent character recognition) technologies and the material is then filed. However, the library has a huge challenge to do the process in that they are shot of the staff to do the huge and tedious work of scanning the document with only one scanner.

Thereafter, the material is then converted to PDF format. Then the institutional repository administrator log onto Dspace and choose one of the submission methods. One of these methods include clicking a "Start a new submission" button, selecting the Collection to submit and click "Next". These steps requires the administrator to formulate the metadata of the material and set them in the fields. The arrangement of the fields reflects the descriptive cataloguing principles and standards. Hence the metadata includes authors, title, issue, publisher, series, language, keywords, and the abstract. Thenceforth, the cataloguer submits the material to the central administration for

verification of the consistence of the metadata according to RDA convention rules of descriptive cataloguing. The work is double checked for any incorrectness. Once the submission is verified, then click "Next" which leads to the last step of uploading; the license. This includes information about rights held with respect to the resource, ideally informing the user of the resource can be used. The rights may encompass Intellectual Property Rights, Copyright and other law that protects the right of the owner of the work. Finally, click the "I Grant the License" button and Upload procedure is done.

4.3 Free and Open Source Repository Software Tools

The researchers interviewed the stuff members from the CICT department in order to achieve objective number three (3) which was to identify an appropriate open source software tool for setting up a subject institutional repository, they are responsible with the setting up and configuration of the university of Zambia institution repository. They mentioned quite a number of the different free and open source repository software tools that can be used to implement IRs, these software tools have common features, they are generally have varying requirements that are used in different domains. DSpace, eprint, greenstone, sdsware, fedora, commands and i-Tor are among the most popular repository software tools. But the university of Zambia institution repository uses DSpace software tool.

The participants explained to the researchers why the institution uses this software. Among other reasons why they chose Dspace software tool is because of the fact that it is expressly created as a digital repository to capture the intellectual output of multi-disciplinary research organisations. In addition, Dspace integrates a user community orientation into the system structure, this means that this design supports the participation of the schools, departments, research centres, and other units. The requirements of these communities might vary; DSpace allows the work flow and other policy-related aspects of the system to be customized to save the content, authorisation, and intellectual issues of each community. Supporting this type of distributed content administration coupled with integrated tools to support digital preservation planning, makes DSpace well situated to the realities of managing a repository in a large institutional setting.

Further, the researchers found that DSpace is easy to install. This is because it comes with an easily configurable web based interface (available in 22 languages, optimized for Google scholar

indexing), which any system administrator can install on a single Linux, mac OSX or window box to get started.

Furthermore, Dspace allows deposit of digital content and Meta data into the repository by users (researchers or librarians on their behalf); this is done by following an approval work flow indicating the policies for reviewing and approving of the materials to be lodged for submitting. The study also found that DSpace allows a wide range of digital material types including text, images, moving images, mpegs and data sets, with an ever-growing community of developers, committed to continuously expanding and improving the software, each DSpace installation benefits from the next and it is very flexible. As if the aforementioned is not enough, Dspace includes a core set of functionality that can be expected to or integrated with complementary services and tools in the larger scholarly system.

The members of stuff recommended DSpace software tool to the researchers when setting up the subject institutional repository for the department of library and information science in the school of education as it is the best from the rest of the repository software's according to them and other literature.

4.4. Subject Repository Feasibility

To find out how feasible it is to set up the subject institutional repository, the subject institutional repository was set. It was formatted in a structure of systematic arrangement of communities (according to departments). Under these communities are collections meant to facilitate the type of documents generated in the institution (students' report, thesis, dissertations, and others). The subject repository was set using Dspace software. This is because Dspace is designed in such a way that it integrates a user community orientation into the system's structure. In the case of an institution to use individual subject repositories for each school, Dspace supports the participation of the schools, departments, and research centers. Below is the screen shot of the home page of the subject institutional repository for the school of education that was set.
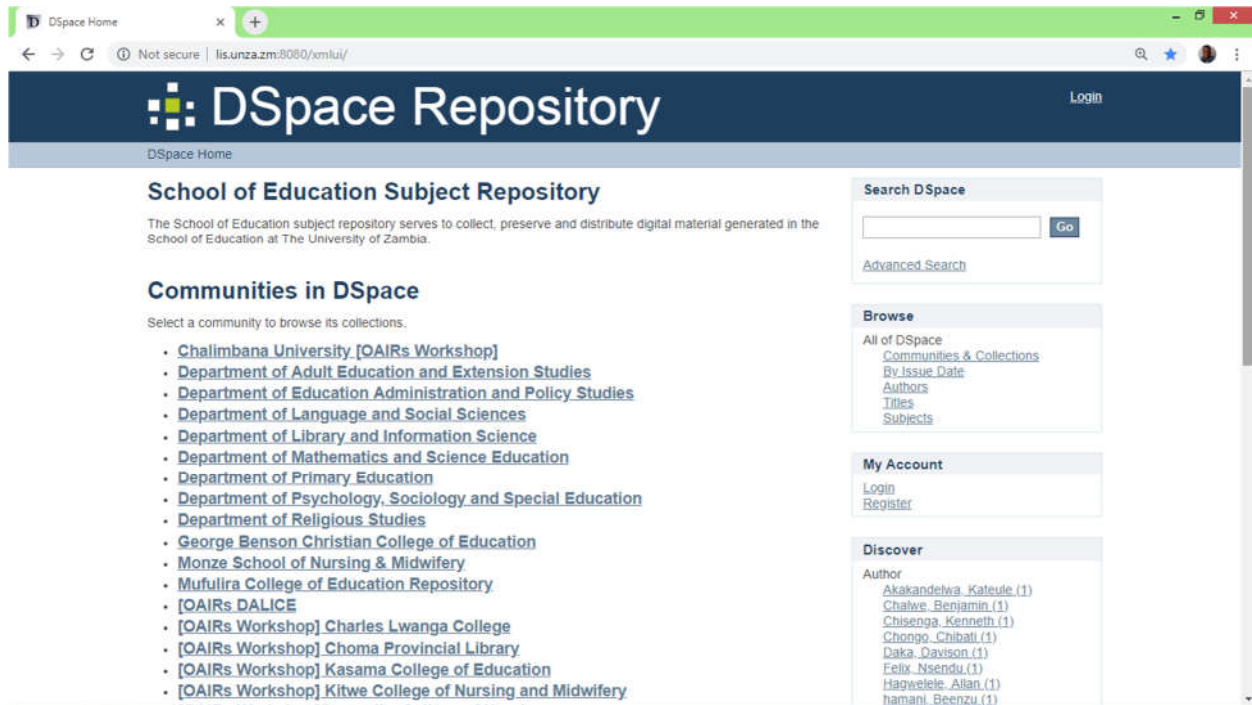
The home page of the subject institutional repository for the school of education.

Source: http://lis.unza.zm:8080/xmlui/

4.5 Subject Repository Usability

To find out the usability of the subject repository that was set 40 individuals participated in the survey. Of the 40 participants, only 36 of them fully participated. Therefore, only 36 questionnaires were considered in this research. To determine the learnability of the participants, they were asked whether or not they have had any ICT related course. The results showed that out of 36 respondents, 21 of them have had ICTs related courses and 15 of them have never had any ICT related course. These results are shown in table below.

Responses pertaining participants' having ICT related courses

Response	Number of responses
yes	21
no	15

Participants who have had ICT courses and those who did not

From the total respondents of 36, 1 respondent have had less than 1 year experience in using ICTs, 5 of them have had 2 to 3 years of experience, 21 respondents have had 3 to 4 years of experience and 9 of them have had 5 years of experience. Figure 5 below shows the results stated.
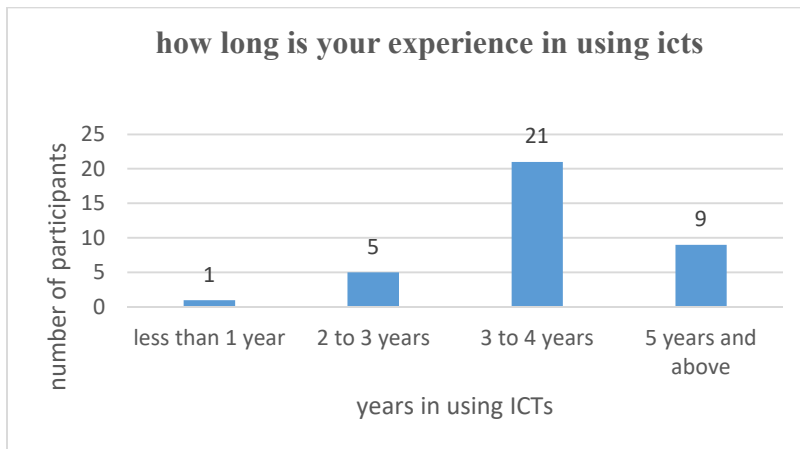
Figure 5: Participant years of experience in using ICTs.

The lowest scores of SUS ranges from 20-40 and highest ranges from 81-100, which indicates how deviated some scores are from the average score. According to the scores of each participant, it shows that one (1) of the participants graded the system within the range of 20-40, 10 participants graded the system within the range of 41-60, 21 participants graded the system within the range of 61-80 and interestingly, 4 participants graded the system within the range of 81-100. The details of the scores for participants are shown in figure 6 below:
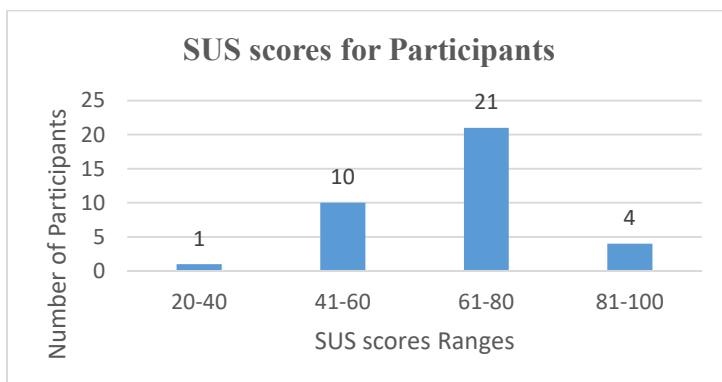
The calculated mean of the SUS score was 65.5 and the standard deviation was 12.9. This calculated mean shows that the system is rated between *okay* and *good* with regards to Bangor et al (2009) SUS rating scale, as shown in the figure below.

Bangor's SUS rating scale

Adjective Rating	Mean Scores
best imaginable	90.9
excellent	85.5
good	71.4
okay	50.9
poor	35.7
awful	20.3
worst imaginanable	12.5

Figure 7: Bangor's SUS rating scale.

Source: Bangor et al (2009).

5   DISCUSSION

5.1 Repository Content Analysis

The study reviewed that the year 2014 recorded the highest number of material uploads on the repository. From 2014 till date there has been a decline in the number of materials on the repository (as it can be seen; the year 2016 only recorded 198 material uploads). However, the number of scholarly ou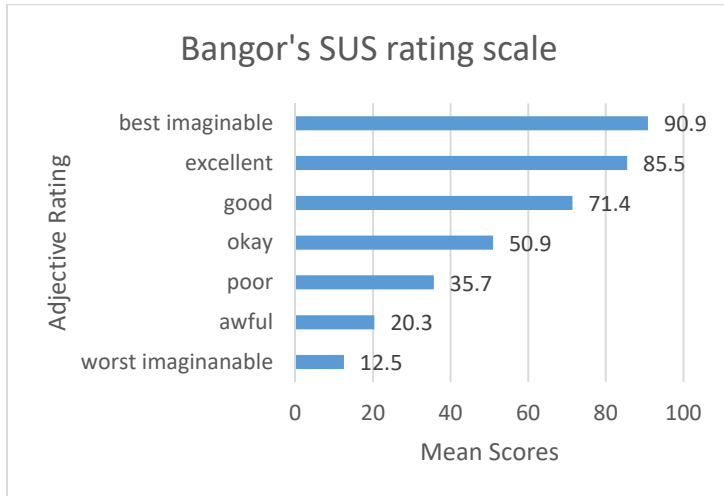tput uploaded on the repository per year as the study has reviewed is not convincing. This is from the idea that the population of the university keeps on increasing every year, and also when considering the fact that projects reports and dissertations are written every year. This shows that the repository is not used as expected by the university's community. This may be due to the idea that the majority of the university's population has less or no knowledge about the institutional repository and its importance. Hence, its value to the academic world is not recognized, and therefore, underrated.

In addition, according to the study, the school of Education records lesser material uploads per year than expected, despite it being the highest populated school in the university. Everyone would expect the school of Education to be topping in almost every activity in the university as its enrolment rates are high every year. However, this is not the case when it comes to the number of scholarly output uploaded on the repository each year. This brings a lot of questions as to why this can be the case. Lack of knowledge about the repository (as already mentioned earlier), and the unwillingness to disseminate knowledge through online archiving may be among other contributing factors to the situation where some schools are recording small numbers of material uploads even when they have higher populations than others in the university.

Further, the study also went further to find out how each department in the school of education is performing in relation to the uploading of scholarly output on the institutional repository. The study therefore reviewed that the department of Library and Information Science (LIS), and the department of Languages and Literature are the favorites, with only 20 uploads each. These records are unfortunate, especially to the LIS department as it was supposed to be the leading department in as far as uploading materials is concerned as its staff and students may be believed to have more knowledge about the importance of the institutional repository.

Furthermore, despite student project reports being produced every year, the study reviewed that the highest number of reports uploaded is 574 in 2013. Years after 2013 have experienced very minimal numbers of student reports on the repository. This is so worrying especially that thousands of students graduate every year, hence thousands of project reports are produced every year, and it is the expectations of everyone that the repository should have higher numbers of student's reports. But on the contrary side, the opposite is the case.

5.2 Existing IR Workflows

According to the research, although the adoption of the work flow management system and procedures have been a great deal of help in allowing easy handoffs between several individuals in many different departments, the fundamental issue in scaling up an IR operation is finding the right balance between available staff and available content, having staff without content volume creates frustration and having volume without staff creates overloads. Subject repository will help in reducing the work of the staff in that students will be able to do the uploading of the materials by themselves. In addition, it will also enhance more accurate subject description for various departments and schools. This is because every scholar will be uploading the scholarly output by themselves, unlike where everything is done by one person.

5.3 Feasibility and Usability of Subject Institutional Repository

The results showed that more than half of the participants have had an ICT related course. Hence this indicated that the participants have at least acquired basic knowledge in ICTs. Their having of such knowledge implies that they are likely to use the Subject Institution Repository with less challenges and that in itself will call for them to find the system useful. Hence the results gave a momentary view of how a good number of users are likely to have ideas and easily follow the procedures to undertake when uploading the content material onto the system. However it is also important to be concerned about the participants who have never had any ICT related course. These are likely to be on a poor corner of rating the usability of the subject institution repository.

On the other hand, it is vital to also realize that all the participants whether or not they have had an ICT related course, they are not entirely disadvantaged in using the system. This is because they are likely to have had experiences in using ICTs and have therefore learnt many computer skills informally. Interestingly, majority of the participants have had experience in using ICTs for three

to four years. This relates to the population the fourth year students which the research targeted. To have had this number of years in experience which correlates to their year of study, it indicates that each student is likely to use ICTs as they are acquiring education at the University of Zambia. This therefore entails that all the potential users of the system are likely to have the ability to learn fast on how to use it. Hence, the learnability of the students and other prospective users is possibly there. Based on the experience of the participants in using ICTs, at least all of them have experienced and according to the observation that was made, they did not have any challenge in doing the first step of uploading the document which is login in to the system. This showed that it is possible for the users to do self-archiving other than depending on the central administrators of the system to do such a trivial task of just uploading their document onto the system.

According to the results obtained using the SUS questionnaire, it shows that the participants had wide range of reactions to the system. This is evidently shown by the standard deviation of the calculated SUS scores of each participant. The standard deviation expressed how much the members of the group of the participants differed from the mean value for the group. This clearly defines how the opinions and viewpoints of the members of the participant group varied. This indicates that impressively, the participants had different perspectives about the Subject Institutional Repository. This should be the reason why some of participants rated the system within the score of 20 to 40 (which is the rate between awful and poor according to Bangor's SUS rating scale) while some participants rated the system within the score of 80 to 100 (which is the rate between excellent and best imaginable according to Bangor's SUS rating scale). Therefore, this fact places the study in a position to point out the need for the central administrators of the Repository to take up measures of providing information about the repository to the potential users.

On the other hand, the fact that the majority of people rated the system within the range score of 61 to 80 give the idea of the general overall score to be assigned to the system. Interestingly, the score is determined by the calculated mean of the SUS scores of all the participants. Therefore, the overall score of the system is the mean calculated in the appendix (1) which is 65.5. With regards to Bangor's et al (2009) SUS rating scale, the Subject Institutional Repository is therefore on the scale of *Okay*. This rating entails that the system is on the good position in terms of usability. However, it also implies that there is need for improvement. Hence, it gives this paper an authoritative urge to ask a thought provoking question saying "in what ways should the system be

improved?" The answer to such a vital question can be derived from the comments that the participants gave pertaining the system.

According to the comments that were given by the participants, majority of them seemed to support the usage of the Subject IR. Their comments showed positive attitudes towards the use of the platform. Most of the participant expressed positive view on use of the Subject IR in their comments, and they made it clear that this platform must be implemented as soon as possible so as to increase the dissemination and accessibility of scholarly output. However, some respondents in their comments made it clear that there is need for sensitization so as to let many students have knowledge on how to use the repository. This is from the fact that some students have less knowledge about it, and hence may encounter problems to use it when implemented especially on the matter of assigning the Meta data of the document when uploading it. Administrators should therefore come up with ways on how to educate students about the Subject IR; what it is, its importance, and how to use it.

6 CONCLUSION

6.1 Conclusion

To use the subject institutional repository at the University of Zambia is possible. The results of the research is showing such possibilities by first quantifying the research footprint of the UNZA Institutional Repository. This enables to determine the performance of the current subject institutional repository and the prospective potentiality of using a decentralized system (subject institutional repository). One of such prospective is a matter of devolving to individual schools of the institution the work of depositing scholarly output of its members. It is also interesting to note the fact that the research established workflows used when depositing content into the repository. The library has a huge challenge to do the process in that they are shot of the staff to do the huge and tedious work of scanning the document and depositing them on to the repository. Using the subject institutional repository is likely to give the library staff to concentrate on other matters of library work rather even on the work of content depositing which can even be done by every members of the institution by practicing self-archiving. The research has also identified the appropriate software tool that can be suitable to use for setting up the subject institutional repositories of every school of the institution which is Dspace. And most importantly, the subject institutional repository proved to be usable and useful and it is learnable to use it. However there is room for improvement so as to make it even more feasible.

6.2 Recommendations

In the light of the aforementioned discussion, the following recommendations are made:

- As regards copyright issues, authors should be educated on their rights in relation to their intellectual output. This will promote self-archiving among the members through using a subject institutional repository if it is to be implemented.
- Schools have to purchase enough scanning machines so as make the scanning process of documents easier. This will enable the scanning of multiple documents at the same time.
- The subject institutional repositories that will be set should use Dspace software tool and it should be structured in such a way that the search and retrieval of materials is easy.

- Schools and the central administrators of the main repository should come up with collaborative awareness programs to increase the scholars' knowledge about the use and the importance of the IR.

6.3 Recommendations for future work

- One of the most obvious delimitations of this study is the absence of data pertaining to challenges militating against the Institutional Repositories in Zambia. Hence, it is important that future research concentrate on the challenging issues in the establishment and development of IRs.
- Secondly, studies can be carried out to uncover if at all scholars have any challenges with the workflow which is taken for them to upload their scholarly output on the repository. This is important because it can determine whether the workflow is contributing to the less usage of the IR.

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APPENDICES

APPENDIX 1

Repository Usability Study: Task List

WELCOME!

To participate, you are to do a task of uploading your research proposal on the school of education subject institutional repository. Then after that you are to answer a questionnaire expressing the experience you will have when uploading.

The following are the instructions of the procedures of uploading the material.

1. Firstly, enter into the website of the School of Education Subject Repository.

   - Website: http://lis.unza.zm:8080/xmlui/

2. Secondly, Login to the subject repository system

   - Click on the login area

3. Thirdly, enter your email and password

   - Email: computer@unza.unza.zm (e.g. 14089394@student.unza.zm)

   - Password: computer number (e.g. 14089394)

4. Fourthly, upload the files to the subject repository

   - Click on start a new submission

5. Select a collection you want to submit to (the collection is the your department and the type of material you are uploading)

   - Click next

6. Describe the contents of the files, (i.e. title, author, publisher…)

   - After finishing, click next step.

7. Choose file that you are uploading from the computer drive (i.e. the proposal you are uploading)

   - Click upload and exit button

And you are done!!!

Now please fill out the System Usability Scale (SUS) questionnaire to express your experience.

APPENDIX 2

INTERVIEW GUIDES

Dear respondents,

The aim of this interview is to obtain information on all the procedures undertaken in depositing of content onto the University of Zambia's institutional repository. On a plus note, the interview Also aims at obtaining information on the repository setup and configuration processes. You have been selected to take part in this research project, the researchers assure you strict confidentiality and anonymity. Your area of expertise assures the researchers that you will provide the information needed.

A. INTERVIEW SCHEDULE FOR THE LIBRARY:

DEPOSITING OF CONTENT INTO THE REPOSITORY

1. What is your current position in the library?
2. What responsibilities does your position involve when it comes to handling institutional repositories?
3. Who qualifies to upload their content materials on the institution repository?
4. What avenues of assistance have you pursued to encourage participation and deposit in the University institutional repository?
5. What is your role as a librarians in encouraging and facilitating staff and Student deposit into the institutional repository?
6. What materials are deemed legible to upload on the institutional repository?
7. What procedures do you use to foster successful deposition of scholarly output in the University's institutional repository? (Probe: Ask about how this relates to openness and increased exposure of the items within the institutional repository, and whether these facets are being used to encourage deposit.)
8. What current challenges do you encounter as you are carrying out the work of content depositing in the institutional repository?

B. **INTERVIEW SCHEDULE FOR CICT:**

REPOSITORY SETUP AND CONFIGURATION

1. What software tool does the institutional repository currently use?

2. How is the configuration work for current software tool you are using?

3. Are there any encountered challenges you face when configuring the institutional repository software tool?

   (a) If yes: what are the challenges do you face?

4. Why did you resort to using the software tool stated in (question 1)?

5. Apart from the stated software tool, what other software tools would you recommend to setup a subject institutional repository?

   (a). Of the mentioned software (question 3) which one do you think is more satisfactory?

   (b). how feasible is it to use this software tool (mentioned in a) in setting up a subject institutional repository?

APPENDIX 3

Usability of Subject Institutional Repositories Questionnaire

Participant ID: _____   Date: ___/___/___

Instructions: For each of the following statements, mark one box that best describes your reactions to the subject institutional repository.

	Strongly agree				strongly disagree
1. I think that I would like to use the subject institutional repository frequently.	☐	☐	☐	☐	☐
2. I found the subject institutional repository unnecessarily Complex.	☐	☐	☐	☐	☐
3. I thought the subject institutional repository was Easy to use.	☐	☐	☐	☐	☐
4. I think that I would need assistance to be able to use the subject institutional repository.	☐	☐	☐	☐	☐
5. I found the various functions in the subject institutional repository were well integrated.	☐	☐	☐	☐	☐
6. I thought there was too much inconsistency in the subject institutional repository.	☐	☐	☐	☐	☐
7. I would imagine that most people would learn to use the subject institutional repository very quickly.	☐	☐	☐	☐	☐
8. I found the subject institutional repository very cumbersome /awkward to use.	☐	☐	☐	☐	☐

9. I felt very confident using the subject institutional

Repository.

10. I needed to learn a lot of things before I

Could get going with the subject institutional repository.

Please provide any comments about the subject institutional repository:

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THANK YOU FOR YOUR PARTICIPATION