AFRICAN INSTITUTIONAL REPOSITORIES AS CONTRIBUTORS TO GLOBAL INFORMATION: A SOUTH AFRICAN CASE STUDY

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ABSTRACT

Globally, institutional repositories (IRs) have become part of the services offered in academic libraries. This is, however, not yet the case in African academic libraries. In South Africa, the majority of academic libraries have embarked on digitising their research output. The aim of the study reported on in this article was to describe the IR of the University of Zululand (commonly known as Unizulu). A literature review, personal experience and observations were used to gather information for the study. It was found that although there were a number of challenges in the beginning stages, the project known as UZSpace was launched successfully. It was also found that due to the fact that the open access principle was embraced, and through the use of harvesters, the IR was heavily utilised especially during the first few months after going live – a trend that is still continuing. The article points out the challenges experienced; highlights the current status of the project; and shows the strengths and weaknesses of the project. Recommendations include that the IR management should form its own department under the auspices of the library; staff issues be resolved; and contingency plans be put in place for when a staff member leaves the project. The digitisation of the research materials should also be done in-house instead of being outsourced in order to save time and finances.

KEYWORDS

Africa, institutional repository, open access, South Africa, University of Zululand, UZSpace

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1 INTRODUCTION

Due to developments in the information science world, open access institutional repositories (IRs) in the developed world have already become an entrenched part of available information sources in an academic library. The situation in Africa is, however, far from ideal, and very few academic institutions have so far taken up the challenge of making their internally stored research output available through the creation of IRs. Other than challenges, such as lack of information communications technology (ICT) infrastructure, paucity of funds, lack of human capacity and skills to establish and maintain the IRs (Anbu 2006; Christian 2008; Kanyengo 2006), African researchers, by nature, are not too keen to share their research with foreigners for fear that the information will be 'stolen' and used by outside sources (Ford 2005). These factors impact negatively on self-archiving by researchers which is the ultimate aim of IRs.

South Africa currently has 28 operational IRs (OpenDOAR 2014), some of which have been able to overcome many of the challenges mentioned above and are very successful in making their research output available to the world. This statement is evident in their performance in the world rankings of IRs measured in terms of their visibility, size, development, growth and openness (see Table 1).

Table 1: Top Ten IR rankings in Africa vs. World Rank (Ranking Web of Repositories 2014)

Africa Rank	World Rank	Institution
1	62	University of Pretoria Electronic Theses and Dissertations
2	113	Stellenbosch University Scholar Repository
3	118	University of South Africa Institutional Repository
4	124	University of the Witwatersrand Institutional Repository
5	176	University of Pretoria Institutional Repository
6	195	Council for Scientific and Industrial Research Space
7	200	University of Johannesburg UJDigiSpace
8	264	Rhodes University Eresearch Repository
9	344	Addis Ababa University Libraries Electronic Thesis and Dissertations Database
10	399	Boloka North West University Research Repository

However, some of the smaller universities have to deal with huge challenges in order to stay operational.

This article presents a case study of the development and current status of the IR at the University of Zululand (commonly known as Unizulu), which is a rural university situated in the North East coastal region of South Africa. The IR provides global access to its information sources through harvesters such as OpenDOAR (2014), which is a list of IRs that end-users can use to identify and locate research related archives. The

IR adheres to the OAI-PMH standards for metadata harvesting, that is, the open access initiative protocol for harvesting data in structured XML formats.

Currently the IR content consists mainly of electronic theses and dissertations (ETDs). Digitised test and exam papers, reports and academic staff research output will also eventually be included.

Since the establishment of the IR in 2008, user statistics have shown a dramatic increase from 1 278 searches performed in 2009 to 1 579 904 searches performed in 2013. In 2013, over 18 000 items were used and accessed from countries as far afield as Russia and the Ukraine. Table 2 shows the utilisation patterns among foreign countries for 2013.

Table 2: Top country views (UZSpace IR Manager)

Country	Faculty of Arts	Faculty of Commerce, Administration and Law	Faculty of Education	Faculty of Science and Agriculture
South Africa	2 026	681	1 058	1 138
United States of America	1 246	939	1 000	905
China	1 085	1062	1 004	1 042
Ukraine	1 082	65	48	54
Germany	346	220	284	230
Russian Federation	193	163	150	173
Japan	189	90	129	125
United Kingdom	91	92	94	82
Italy	76	70	1 058	75
Netherlands	76	65	74	70

2 AIM AND OBJECTIVES

This article aims to describe the establishment, development and current position of the IR at Unizulu. The objectives include: to describe the process of the initial development of the IR; to identify the challenges experienced in the process; to give an overview of the current situation and successes achieved; to explore the future plans for the management and expansion of the IR; and to provide some insight into lessons learnt in the process of the development and subsequent management of the IR.

3 METHODOLOGY

A literature review was used to present background information on the topic. A case study was used to describe the development of the IR. One of the researchers formed part of the team concerned with the initial decision to establish and develop the IR, thus practical involvement and records created in the process were used describe the implementation and management of the IR. An interview was also conducted with a staff member concerned with the management of the IR in order to establish the current position of the IR.

4 INSTITUTIONAL REPOSITORIES

Lynch (2003) defines IRs as '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'. A digital repository can also be described as: where digital content assets are stored and can be searched and retrieved for later use (JISC 2005). Such a repository supports mechanisms for the import, export, identification, storage and retrieval of digital assets. Drijfhout (2006) describes a digital repository as an organisation which is overall committed to the stewardship of digital information resources, while Suleman (2007) states that IRs are digital libraries run by an educational/research institution to archive documents owned/produced locally.

Open access repositories such as IRs have in recent years become an important component of the establishment of a global e-Research network as it has the possibility of interconnecting existing repositories. In this manner unified access to scholarly work can be provided. This, however, is dependent on interoperability which will allow the systems to communicate with each other and communicate information back and forth in a usable format (COAR 2013). According to Jain (2010), interoperability allows documents sharing the same metadata tags to be retrieved regardless of their location or format. Researchers are not interested in where the information is stored but rely on search engines to discover and retrieve the information they might otherwise have missed. Using interoperability as a means to collect the world's research output, open access eradicates the need for one central location for storing the research output (COAR 2013).

Within universities, intellectual assets, such as published theses and dissertations, research reports, datasets, presentations, learning materials and audiovisual objects are normally available. In many cases these assets are often the property of individuals within the institution, thus prohibiting open access to much of the available knowledge. In such a case an IR offers great advantages by providing a coherent and coordinated approach to capture, identify, store and retrieve these assets (Lor 2005).

Benefits derived by universities from making their intellectual, educational and research assets available by way of IRs include: enhanced utilisation thereof; improved learning

experiences and teaching methods; the introduction of different learning styles; and importantly the publication and dissemination of publicly funded research results. For staff and students it offers a means of storing and sharing their intellectual assets (JISC 2005). According to Barwick and Pickton (2006) and Jain (2009), an IR offers the following benefits:

- provides a means of enhancing the prestige of an institution, and increases the visibility and marketability of such an institution;
- supports teaching and learning by providing links with the library catalogue and the virtual learning environment;
- provides a central storage space for intellectual output of an institution;
- increases the dissemination and impact of research output of staff and researchers if the IR is accessible through open access;
- stores long-term availability and accessibility of information sources stored in the IR;
- enhances academic communication, by allowing global users the to comment on pre-prints stored in the IR.

Despite the obvious benefits that IRs could offer, the many barriers to their effective implementation still plague universities. Issues such as: resistance to participate from staff and researchers; insufficient funding and technologies; insufficient bandwidth; high price of Internet services; high import duties on ICT equipment; limited training and lack of manpower; and several legal issues, still need to be overcome.

5 STATUS OF INSTITUTIONAL REPOSITORIES IN AFRICA

Most African libraries possess large volumes of locally produced research reports, theses and dissertations, and among staff members additional locally produced sources, such as annual reports, technical reports, consultancy reports and feasibility studies are produced, which when made available through the electronic medium could significantly contribute to local content (Chisenga 1999). Significant growth in the development of IRs has taken place in recent years. Uzuegbu (2012) reports that in 2012, Africa had 48 IRs, while according to OpenDOAR (2014), there are currently 78 established IRs. Despite this growth Africa's contribution towards the accessibility of research output by way of IRs is still meagre as illustrated in Figure 1 which shows that the continent houses only 4 per cent of the IRs globally.

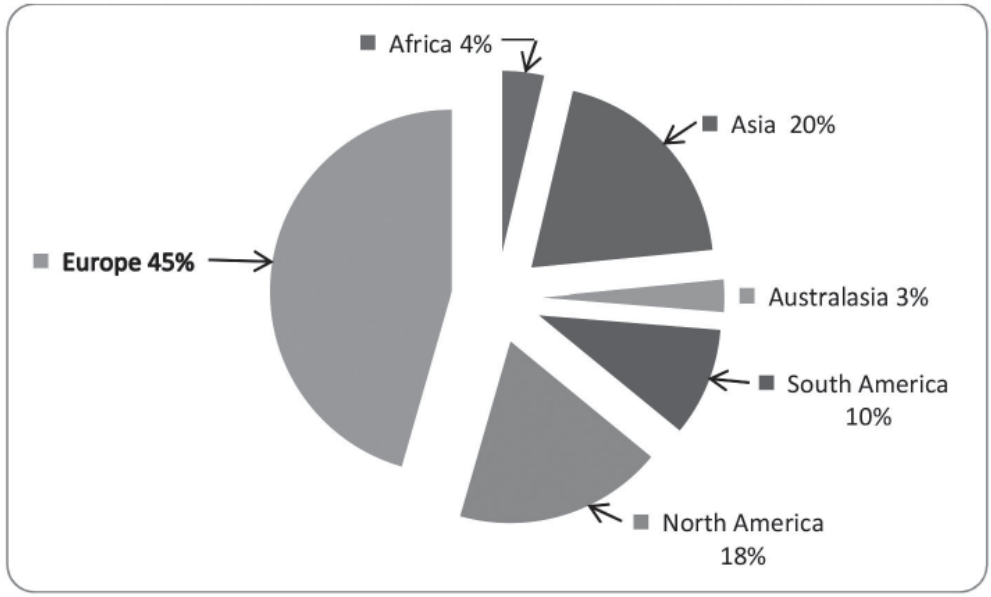

Figure 1: Global distribution of IRs (OpenDOAR 2014)

A number of problems contribute to this situation, and among those mentioned in the literature are: the ongoing commitment to the funding of the IRs; lack of familiarity with open access repositories; lack of an Information Policy governing issues such as intellectual property rights and copyright, poor ICT infrastructure; insufficient technical knowledge to make informed decisions on the hardware and software required for digital preservation; and the lack of training to library staff members to preserve and archive digital information sources (Chisenga 1999; Christian 2008; Jain 2010).

6 INSTITUTIONAL REPOSITORIES IN SOUTH AFRICA

South Africa has a total of 28 registered and active IRs (OpenDOAR 2014). The Council for Scientific and Industrial Research (CSIR), though not a university, is a major research institute with a wealth of research documentation available. This IR also forms part of the development of South African IRs.

The first steps towards the electronic submission, storage and dissemination of theses and dissertations in the country date back to the early 1990s (Lor 2005). In 2002, the South African government published a national research and development strategy for South Africa, inviting input from all stakeholders concerned with the challenges posed by increasing economic growth and the improvement of the quality of life for all South

Africans. This resulted in the establishment of the South African Research Information Services (SARIS) Project with the aim of providing a framework for e-research services to all South African researchers (Van Deventer & Pienaar 2008). The initial proposal was for a nationally co-ordinated system funded by joint funding from all participating institutions, but eventually funded by money generated from those who used the system. This, however, soon proved to be an ideal in the distant future and this formed the impetus for the development of individual IRs. In this regard Electronic Information for Libraries (eIFL) and the Mellon Foundation proved of valuable assistance. Despite the fact that the initial drive was executed in isolation, the scene changed in 2007 when a mailing list connecting all the existing African and South African repositories was initiated, whereby common interests could be shared (Van Deventer & Pienaar 2008).

The first IR was established in 2000 at the University of Pretoria (UP), concentrating mainly on theses and dissertations. In 2006, the IR at UP expanded its content to include all publication output from the university as well as digitised historical and archival materials donated to the university. Other universities, such as the University of Stellenbosch, Rhodes University, the University of Johannesburg and the University of South Africa, followed UP's example and in most cases firstly digitised theses and dissertations before progressing to other available information sources (Nkosi 2008; Olivier 2007; Van Deventer & Pienaar 2008; Van der Merwe & Kroeze 2008).

7 THE UNIVERSITY OF ZULULAND

The IR at Unizulu is one of the latest additions to the growing list of IRs and its development will be discussed in detail in the following sections.

Although this project is still in the early stages of implementation, valuable lessons were learnt that should be shared with other universities to assist with the unique challenges of the rural university environment.

Unizulu is a rural based university on the east coast of the KwaZulu-Natal (KZN) province. Known within the South African context as a previously disadvantaged higher education institution (HEI), combined with its isolated geographical position, it faces its own unique challenges in terms of information access and dissemination of own published content to a wider clientele.

Unizulu is situated in KwaDlangezwa North of the Tugela River in KZN. Richards Bay, the closest large urban area, is situated 23 kilometres North East of the university and Durban 142 kilometres to the South. It was established in 1960 as a university college, and was granted university status in 1970. The university is relatively small with just over 16 546 registered students for 2014, with a significant percentage of postgraduate students and researchers from neighbouring countries, such as Swaziland, Botswana, Lesotho, Mozambique, and from far away countries, such as Kenya and Nigeria.

The mission of the university is to generate knowledge through research and to provide relevant education in order to produce knowledgeable graduates. As mentioned earlier, the location of the university creates challenges to students, academics and researchers in accessing information sources. Unizulu has recently upgraded its Internet bandwidth and provides unrestricted access to the Internet to all researchers and academics, and restricted access to students. Yet, although it also has a well-equipped library on campus, users still complain about problems with access to content due to insufficient Internet bandwidth.

The mission of the library on campus is to be an integral part of teaching, learning and research support by offering quality information services and resources to students, academics and staff members. To attain this mission the library promotes access to information; provides information literacy training; and collects and maintains a relevant and balanced stock of information resources. A major part of the existing collection consists of the Unizulu collection which is a special collection of information resources with local content and consists among others of bound copies of Master's and Doctoral theses, dissertations and research done at the university. A significant percentage of research done at the university inherently reflects information and knowledge of Zululand as research topics concentrating on issues and subject fields from the area. The collection also houses several policy documents, minutes of meetings and historical Zululand documents.

Until recently, the collection was only available on hard copy, but it is used extensively by students and researchers alike (Van Wyk & Mostert 2011). Though research output at Unizulu is relatively high, and well used locally, the collection shares the same fate as those of other African university research collections in that as Anbu (2006) aptly states: 'Apart from the research, the visibility of the African scholarship is also kept to the minimum, mainly because of access and publishing inabilities.'

7.1 THE UNIVERSITY OF ZULULAND INSTITUTIONAL REPOSITORY PROJECT

The management of the Unizulu library realised the value of an IR for Unizulu after witnessing the success of the Durban University of Technology's (DUT) IR project which was established in 2006. In the first year of implementation at DUT, the database was accessed by over 4 000 researchers on the World Wide Web (Web). It was clear that this was a golden opportunity for the library to support the research function of Unizulu and to disseminate local content to a wider audience than just local researchers. The decision to start an IR on campus, known as UZSpace, was taken in 2007.

In October 2008, a steering committee to plan and implement the project was established. It was important to have a representative committee at Unizulu to get planning and awareness off the ground. The initial committee consisted of the Deputy Director of the Library who is also the chairperson, two representatives of the Department of Library

Science, the ICT Department, a senior information librarian, a library assistant and a technician. It has since been realised that a representative of the research committee would add value to the committee and the project, and a member of this committee was therefore co-opted.

A three-phase project plan with flexible time lines stretching over three years was drafted (see Figure 2). Phase one concentrated on the technical setup of the system, as well as the scanning of all existing hard copy theses and dissertations. In the second phase, recently completed Master's and Doctoral theses, as well as exam papers, with their accompanying metadata records were to be made available. This would also be linked to the Online Public Access Catalogue (OPAC) through metadata editing. In the last phase, the Unizulu art collection was to be added as well as all research articles published by staff and researchers affiliated to the campus.

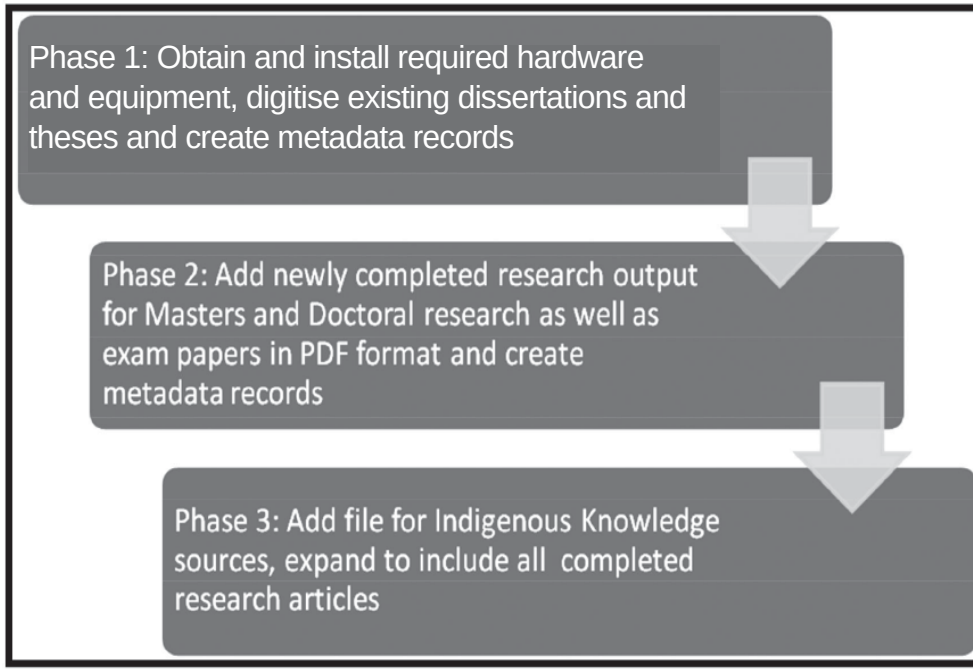

Figure 2: Phased approach of the Unizulu IR project

The first task of the committee was to install appropriate software on an IBM 3400 machine, with 125 Gigabytes of storage space. Different options were considered. Initially the library's proprietary software, Unicorn's Hyperion module was considered, but it proved to be very costly in terms of annual licence fees. The open source route was deemed more suitable based on affordability as well as support from universities in South Africa. The ground breaking work of UP and DUT served as motivation to implement the DSpace open source software. In terms of maintenance of the system the library

is in the fortunate position that the Eastern Seabord (esAL) Consortium, consisting of Unizulu, Mangosuthu Technikon (Durban) and DUT, shared the services and expertise of a systems administrator with skills in managing open source programmes. Training in the use of DSpace was done at UP.

Secondly, a scanner with optical recognition capabilities (OCR), was purchased and a decision was taken that research output would be made available in PDF format to prevent any changes to the original. Other activities undertaken included:

- the drafting of a policy document to be approved by the Library Committee and Senate;
- the identification and approval of funds for the implementation of the first phase;
- the identification of gaps in skills and staffing requirements evaluation of training options;
- the preferred format for storing information was identified to be the PDF format in order to prevent any changes to the original;
- the compilation of an awareness and marketing strategy.

A decision was also taken that the digitisation of the IRs would not take the form of an institutional archive or a document management system, and would not accommodate extensive policy documents. The emphasis would be on making the research results available to the university community and providing open access to the broader research community. The primary objective for the establishment of the IR would be to share the value of local research and local content with researchers, and not to be an administrative tool for archiving. Though the current Unizulu collection houses several administrative documents it was therefore excluded from the digitisation project.

8 CHALLENGES FACED BY THE UNIVERSITY OF ZULULAND INSTITUTIONAL REPOSITORY PROJECT

8.1 Initial development stage

Early in the project the committee realised that certain aspects should be revised as challenges were identified which would have an impact on its success. Meta data editing and cataloguing is labour intensive and Unizulu has a shortage of resources and skills. It was decided that retrospective digitisation would be reconsidered and that new research should be targeted.

It furthermore became evident that a number of departments had fears about the quality and integrity of both the research results and the theses.

The challenges that could impact on the longer term success of the IR in the case of the UZSpace project could be grouped into the following three distinct groupings.

8.1.1 Institutional challenges

Institutional challenges refer to those challenges that are related to the university's policies and procedures outside of the library control, but have an impact on or intersect with the library and then more specifically the functioning and implementation of UZSpace, for example:

- the absence of a dedicated copyright officer in both the library as well as the university at large;
- changing university policies to ensure that the library gets a copy of the completed research projects in the correct format;
- corporate/institutional culture resistance to change;
- inadequate institutional knowledge management strategies;
- poor departmental procedural alignment;
- working in silos and lack of aligning peripheral projects such as RIMS;
- lack of contingency and support when decision makers change office.

8.1.2 User group challenges

User group challenges are those challenges that the committee identified with users and potential users which in this case included the researchers, students as well as external users. The challenges faced on a systems or project management level are those typically explained in the literature by information and information system's management processes, such as:

- reluctance of researchers to share research or entrust the library with their research;
- plagiarism problems;
- involvement of academic departments in processing information;
- resistance to self-archiving;
- addressing concerns of departments regarding quality and integrity of research results.

8.1.3 IR system and project management challenges

IR system challenges: examples that the IR project faced in terms of these groupings are given below:

- general skills – and staff shortages among the library staff;
- funding contingencies for phase two and further phases;
- the impending disbanding of the esAL Consortium and thereby the loss of a systems administrator;
- the need for a separate server as well as an additional backup server;
- specifications in terms of the size of a server and PC;
- what additional equipment in terms of printers and scanners are needed;
- how to establish open access in the UniZulu IT environment;
- the need to learn basic HTML commands for DSpace community descriptions;
- accomplishing open access and not compromising security.

9 CURRENT STATUS OF THE PROJECT

The project leader responsible for the IR left the employment of the library early in 2013 and has not yet been replaced. The IR is currently managed by a staff member who in addition to her normal library workload is responsible for the management of the system. The staff member has not received any formal training and has learnt the trade by visiting other institutions with established IRs and observing how it is done. The disbandment of the esAL took place and the loss of the dedicated technician has resulted in a loss of system support. An on-campus technician has, however, been made available to assist if any problems arise. An officer with skills to deal with copyright issues has still not been employed, hence the decision to concentrate only on materials that do not require copyright clearance.

Currently, the IR contains 1 247 digitised items, mainly current and retrospective theses and dissertations (see Table 3). Current research is delivered to the library by the examinations section in the form of a disc. It is the responsibility of the researcher to save the research on the disc prior to presenting it to the examination section. This has resulted in many challenges as the research chapters are sometimes presented as separate files or chapters and stored as a PDF file, which then requires the IR staff to merge it into one document and then save it again in PDF format. Some discs are also presented in MsWord format which then has to be converted into PDF format. Other challenges are that sometimes the disc is empty or some of the pages especially the preliminary pages or the appendices are missing. In this case the research is not incorporated in the IR. The retrospective digitising of documents is done by a Cape Town based company as the IR manager does not have the time to spend on this time-consuming activity.

Table 3: Digitised items and visits per faculty (UZSpace IR Manager)

Faculty	Number of items	Visits in 2013
Faculty of Arts	617	8 060
Faculty of Science & Agriculture	272	4 577
Faculty of Education	308	4 989
Faculty of Commerce, Admin & Law	50	4 919
Total	**1 247**	**22 545**

Academic staff and researchers can request that their work be put under embargo for a certain period if they do not want it to be made available to the general public. If such a request is received, then it is referred to the Library Manager for a final decision.

All the equipment, such as PC hardware, scanner and servers, has been purchased and installed. The scanner, however, has become defective and although it can still scan documents, it cannot cope with a huge volume of work, hence the outsourcing of the scanning of retrospective theses and dissertations. A separate server, funded by the Melon Foundation, and needed for back up purposes was installed, and according to recovery principles, is housed in a separate location.

A policy document on the management of the IR has been drafted, but has not yet been officially accepted. The policy documentation at university management level has been changed to formalise the handing in of a digitised version of a research document to the examination section which then forwards it to the library.

As the sustainability of the IR is very much reliant on the marketing of the project library, staff provide regular training classes for postgraduate and undergraduate students as well as academic staff members on the utilisation of the IR. It is also marketed on social media such as Facebook. Usage statistics are, however, closely monitored to see trends emerging. Table 4 provides insight into the utilisation patterns in 2013.

Table 4: Annual visits to UZSpace

Month	Item Views	Collection Views	Community Views	Searches Performed
Dec 2013	36 817	1 546	1 496	92 292
Nov 2013	40 665	1 942	3 918	96 878
Oct 2013	44 317	2 482	2 041	147 662
Sep 2013	38 936	1 762	1 825	151 850
Aug 2013	42 328	1 816	2 001	221 454

→

Month	Item Views	Collection Views	Community Views	Searches Performed
July 2013	37 896	1 586	1 787	138 720
June 2013	38 098	1 389	1 992	122 425
May 2013	41 250	1 877	1 902	166 162
Apr 2013	46 304	1 808	2 100	163 430
Mar 2013	33 981	1 710	2 093	136 046
Feb 2013	32 423	1 168	1 477	133 181
Jan 2013	27 125	1 230	1 279	146 234

10 STRENGTHS AND WEAKNESSES OF THE INSTITUTIONAL REPOSITORY

The planning and initial implementation of the UZSpace project was indeed a journey through valleys and hills, and although the challenges cannot be disregarded, the value of the finished project, and its contribution towards the strengthening of local content should not be underestimated. Critical to its success would be to capitalise on the strengths of the project, some of which are:

- the content of the existing UZULU collection and the value of the UNIZULU Research. The continued visits both from local and international users are proof of its value;
- a great deal of support from, and networking with other libraries, who launched similar projects, in terms of sharing of knowledge and experience;
- the easy availability of open software;
- the shared expertise of a knowledgeable system manager in esAL during the early implementation phases.

Weaknesses identified are:

- the lack of contingency plans in terms of staffing;
- the lack of an official policy document to assist with the planning and further development of the IR;
- the lack of training for the library staff involved in the project;
- the absence of a copyright officer has hampered the self-archiving of journal articles and research by the academic staff and researchers.

11 FUTURE PLANS FOR UZSPACE

Future plans for UZSpace include moving towards making previous examination papers available and moving on to self-archiving. It is also hoped that in the near future, phase three of the project can be implemented. However, the lack of a project manager and enough dedicated staff for the project is currently hampering these efforts and should first be resolved before any implementation can take place.

12 CONCLUSION AND WAY FORWARD

Though IRs are becoming more commonplace in Africa, they are still far from being a normal service offered by a university library. Over the years, Africa has generated an enormous amount of valuable information that could benefit not only the continent, but also many researchers globally. As long as the information stays hidden on library shelves many possible solutions to problems experienced on the continent also stay unsolved. The establishment of the UZSpace IR has been a step in the right direction and has provided a wealth of knowledge which is accessed on a regular basis by a large number of users, both locally and internationally. Despite all the challenges faced, the UZSpace IR currently ranks 24th on the African continent and number 826 in the world (Ranking Web of Repositories 2014).

For an IR to be sustainable a number of things need to be in place, among others, dedicated staff, policies, support from governing structures and buy in from the academic staff and researchers of the institution. Currently, the project is still operational but is experiencing some serious challenges especially in terms of staffing and technical support, as well as the lack of an official policy to guide the management of the IR. The fact that self-archiving is not in place also means that much valuable research is still not made available to the global population. This problem should be seriously considered as the continued support of academic staff and researchers towards the population of content is one of the mainstays of an IR.

As a way forward it is proposed that the IR staff be expanded to include a project manager who is supported by another staff member and a copyright officer, as well as a dedicated technician to assist with systems problems. These staff members should all be trained in the duties expected of IR managers so that a contingency plan is in place should one of the staff members resign. It should also be considered to make this a specific department which is accountable to the Library Manager. It should also be envisaged to equip the library with the required scanners to handle huge volumes of digitising.

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