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Embedding digital preservation strategies in the management of institutional repositories in South Africa

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Abstract

Institutional repositories (IRs) have received substantial consideration from various researchers across disciplines and around the world. Universities have considered prioritising the IR's functionality by putting in place various measures to make IRs more efficient. This paper focuses on issues of institutional repositories and digital preservation in South Africa. The study drew from the secondary source of information in the African context and around the globe to have a sound argument that is more systematic towards IRs. The paper shows that in the past, various studies have focused on the field of preservation of cultural heritage in general. The gap identified by literature was that there was very little provision of reliable long-term digital repositories in Africa. The literature further revealed that most institutions of higher learning in South Africa are now migrating to have full implementation of digital preservation for their IRs. It is recommended that digital preservation strategies should be embedded in institutional repositories in South Africa.

Keywords: institutional repositories, digital preservation, libraries, South Africa, universities

Introduction and background

Lynch (2003:3) defines an "institutional repository" as a set of services that the institution offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members. The primary impact of the institutional repository movement has been in academia, spearheaded, in part, by university management. However, the digital age has completely altered the way and manner in which information resources are being created, acquired, organised, managed, preserved, disseminated, accessed, retrieved and used (Lynch, 2003). In most universities in South Africa, trusted institutional repositories (IRs) have become one of the primary digital resources that would arguably enhance scholarly communication and open access to information resources for productive advanced learning. Ultimately, a productive academic environment does not only impact the universities' web ranking but, accordingly, it enhances the research visibility of the contributors and the universities.

An IR is a mechanism whose goal is to provide reliable, long-term access to stored and managed digital content for its users, now and in future (Dale & Gore, 2010). The mission of digital repositories is to accept responsibility for the long-term maintenance of digital resources on behalf of its depositors and the benefit of future users. It is important to underscore the fact that in the management of IRs, digital records brought a new dimension in

records keeping systems of IRs that underline trustworthiness. Therefore, trusted digital repositories play a major role in the sense that even if the technology keeps on changing, they will always ensure that users have access to these records. According to the Research Libraries Group Inc. (RLG) and the Online Computer Library System (OCLC) combined their organizations and resources RLG-OCLC Report (2002:21), all trusted digital repositories must:

- have an organisational system that supports not only the long-term viability of the repository, but also the digital information for which it has responsibility.
- demonstrate fiscal responsibility and sustainability.
- design its system(s) by commonly accepted conventions and standards to ensure the ongoing management, access and security of materials deposited within it.
- establish methodologies for system evaluation that meet community expectations of trustworthiness.

This, however, raises concerns regarding whether IRs have policies, practices and performance that can be audited and measured against international standards and models for archival and long-term preservation in South Africa. In archival research, this implies that the management of IRs is underscored by digital records that are generated within a particular context, looking at the rapid change in the digital environment and the context must be understood that it should protect the records' authenticity over time.

Problem statement

A trustworthy digital repository is one whose aim is to provide its designated community with reliable, long-term access to managed digital resources, both now and in future. Many studies that have been reviewed on IRs in South Africa and have tended to focus on open access scholarship and institutional repository from a library science perspective; with less focus on the embedding of digital records in institutional repositories, yet this is critical for long-term preservation of content being provided. The goal of digital preservation is to keep digital content available to user communities for a long time and for future generations.

Digital resources, on the other hand, are kept on fragile magnetic media that deteriorate quickly, necessitating the use of appropriate systems and technologies to permit their accessibility because they are susceptible to loss and destruction (Corrado & Moulaison, 2014). Elsewhere, such as in the United Kingdom (UK), empirical studies tend to uncover the central purposes of institutional repositories, how developments are being affected by policies and researcher behaviour as well as what services and approaches are appropriate in supporting partners involved in scholarly communication and publication of research (Sarke, Davis & Tiropanis, 2010; Marsh, 2014; Jain, Bentley & Oladiran, 2014). Curatorial responsibilities of scholarly research data permeate the entire life cycle of digital objects, not just the creation phase. The curation of digital resources is required with collaboration and input from staff across the entire breadth of institutions. However, issues of long-term digital preservation remain contested in South Africa. Despite the important and rapid growth of research in IRs, few efforts have been made to systematically review the embedding of digital content regarding IRs and its pros and cons in digital preservation in South African universities (Masenya & Ngulube, 2018; Masenya & Ngulube, 2021; Dale & Gore, 2010; Henok & Yule, 2019). According to Masenya and Ngulube (2021), the majority of institutions implementing digital content management systems do not place a strong priority on long-term preservation of digital materials. As a result, it is obvious that many academic institutions still do not prioritise long-term preservation.

Long-term preservation of digital resources is a highly complicated and diverse issue due to technological obsolescence and other reasons, such as a lack of commitment by important stakeholders. Therefore, the study surveyed the content and context of digital institutional repositories in South Africa with the intention of determining the embedding of digital preservation content into IRs to recommend an appropriate long-term digital preservation system or strategy to be used in various institutions in South Africa.

Literature review

According to Rosenthal et al. (2005), the purpose of any digital preservation system is to ensure that the information it contains remains available to users for a long time. For the past few years, academic institutions, on the other hand, have been dealing with how to preserve the digital resources they produce. According to the literature, academic institutions face the difficulty of ensuring that users can access content that had previously been ingested into IRs and other archives due to technology obsolescence. The application of preservation methodologies, tools and tactics to preserve access to reformatted and born digital content independent of technological changes is known as digital preservation (Day, 2006).

When looking at other parts of the world, such as European countries and the United States of America (USA), these are still considered to be the most developed IRs in academic institutions (Lynch & Lippincott, 2005). Lynch and Lippincott (2005) note that about 80 percent of universities initiated their own IR systems which are operational. However, about 12 percent of IRs in Africa are now preparing to fully implement the IRs' operation or functionality. In South Africa (SA), the libraries are currently leading when it comes to implementation of IRs in Africa. Van Deventer and Pienaar (2008) attest to the fact that the University of Pretoria is among the universities that have a fully operational IR and it is considered as one of the best in producing and depositing scholarly materials in the IR. The IR collection mostly consists of theses and dissertations, journal articles and other documentation or records related to IRs.

A study on IRs based on the South African research context by Fullard (2007) observed some of the challenges facing access to IRs as being current awareness and researches in South Africa. The findings revealed that within the predominant framework, there were few prospects that academics would choose to deposit scholarly materials into the IRs. Again, the University of Namibia (UNAM) was also noted as one of the universities that did not have a clear strategy on IR (Henok & Yule, 2019). South Africa is still considered one of the developing countries when it comes to technology. The low usage of IR is one of the issues that lead to institutions not paying more attention to the development of IRs in Africa. This was also evident in the UNAM where low usage by academics was seen, which raised concerns about the importance of IRs (Henok & Yule, 2019). Henok and Yule (2019:19) further state that this issue was "… affecting the recognition of UNAM internationally as a successful research institution and revealed that UNAM does not provide recognition and incentives or full appreciation to academics who deposit scholarly publications in the IR." However, this was different at the University of Zululand in South Africa where the IR of the university was highly accessed from various countries around the world (Ocholla, 2020). According to Ocholla (2020:291), "this collection has now been supplemented with Institutional Repositories (IRs) that enable access to local content locally and globally". With this being said, institutions in South Africa and Africa at large need to improve the trustworthiness of digital information sources for long-term digital preservation for posterity.

There must be sufficient control for the digital material to be authentic, reliable, accessible and continuously useable. This is why the study focused on the embedding of the digital preservation strategies used by the IRs in South Africa in selected universities. This study assessed the extent of digital preservation strategies used and long-term preservation in digital records management so that digital continuity is sustained in the South African IRs. Ocholla (2020:291) notes that "IRs are insignificant in Africa (219; 4.1% of 5,309 globally). South Africa's achievement in Africa (44; 20%) is significant, with the University of Pretoria (UP) leading on the continent." Again, the University of Pretoria in South Africa was growing its collection list, so concrete digital preservation measures need to be put in place.

Methodology

The data collection was largely based on a critical review of the literature concerning the embedding of digital preservation content into IRs in South Africa, using various databases and online searches, including various websites. The study compared various literature within the South African context in order to have a sound argument that is more systematic towards IRs. Qualitative document analysis was employed and supplemented by a systematic literature review to assess the pros and cons of embedding digital preservation content into IR in South Africa. A similar study using this approach was conducted in Malaysia by Asadi, Abdullah, Yah and Nazir (2019).

Findings and discussion

This section provides the findings on how to embed digital preservation strategies in the management of IRs in South Africa. The findings are organised around the objectives of the study, which were to:

- determine the current trends in embedding digital preservation content into IRs in South Africa
- determine the digital preservation strategies in the management of IRs in South Africa
- Recommend future directions on how to imbed digital preservation content in IRs institutions.

Current trends on embedding digital preservation content in IRs in South Africa
IRs provide different scholarly materials that are of interest to universities or research institutions such as peer-reviewed journal articles, theses and dissertations. In some instances, they give authorisation to users to access material free of charge, print or link to the full texts of materials (Henok & Yule, 2019). Many universities in South Africa have implemented IRs for scholarly material. Having effective long-term preservation strategies is considered as having a significant tool that can be used in digital records to ensure access to records and archives. It was evident that staff members had started a data preservation project; however, it became clear that there was no decisive policy framework for the preservation of digital records for the University of KwaZulu-Natal (UKZN) archives.

The findings revealed that various institutions in South Africa use the ETD-db, Digital Commons, EPrints, DSpace and ETD-db as institutional repositories (Onyancha, 2011:67). Onyancha (2011:67) further states that most institutions in South Africa digitise material such as "Publications; Conferences; Theses; Unpublished; Books, Articles and Multimedia" as open access. Onyancha (2011) further notes that South Africa is the one of the countries that produces the most IRs in Africa, as it has 26 universities.

A study conducted by Onyancha (2011:69) revealed that the following institutions operate IR in South Africa:

"1. Academy of Science of South Africa (ASSAf) (1);
2. Cape Peninsula University of Technology (CPUT) (1);
3. Council for Scientific and Industrial Research (CSIR) (1);
4. Durban University of Technology (DUT) (1);
5. North-West University (NWU) (1);
6. Rhodes University (RU) (1);
7. Stellenbosch University (SUN) (2);
8. University of Cape Town (UCT) (2);
9. University of Johannesburg (UJ) (1);
10. University of KwaZulu-Natal (UKZN) (2);
11. University of Pretoria (UP) (2);
12. University of South Africa (UNISA) (2);
13. University of Free State (UOVS) (1);
14. University of Western Cape (UWC) (3);
15. University of Witwatersrand (WITS) (1);
16. University of Zululand (UNIZULU) (1)" (Onyancha, 2011:69).

The study revealed that institutions were responsible for the development and management of IRs in various institutions in South Africa and that institutions such as the University of Limpopo, Tshwane University of Technology, Vaal University of Technology, and others "are still developing, or yet to advance their IRs, or they have not registered their IRs with DOAR or ROAR" (Onyancha, 2011:69). It was further noted that institutions such as UKZN, UP, UNISA and UWC have created more than one IR, offering multidisciplinary and subject-specific resources. The literature further revealed that the day-to-day records that are created during business use are not considered to be part of the collection in IRs, as they are not collected purposefully for IRs (Samiee & Davallu, 2014:3). This, however, gives a clear indication that institutions of higher learning must embark on the embedding of digital preservation content into all institutional repositories in South Africa and it should not only focus on one aspect of libraries; it should also be implemented in all IRs.

Determining the digital preservation strategies in the management of IRs in South Africa

The first IR was established in the early 2000s at the UP, concentrating mainly on theses and dissertations. In 2006, the IR at the UP expanded its content to include all publication output from the university as well as the digitised historical and archival materials that are donated to the university. Various scholars further note that "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 digitized theses and dissertations before progressing to other available information sources" (Van Wyk & Mostert, 2014:104). The purpose of IRs in academic institutions is to collect, organise and preserve digital versions of the institution's scholarship, enhance collaboration and communication by other scholars inside and beyond institutions, contribute to the enhancement of the visibility of institutions locally and globally, increase web ranking of the academic institution, archive academic activities and institutional study, and promote academic outreach locally and internationally.

Looking back at the information science world, IRs have become a thing that is mostly used by scholars around the world as it facilitates open access to IRs. Libraries are leading the implementation of IRs and open access in various institutions in the world. The literature

further revealed that when it comes to African countries, only a few have taken the initiative and implemented IRs. With that said, South African universities have taken the challenge of making sure that they initiate or implement IRs in their institutions. According to Van Wyk and Mostert (2014), the situation in Africa is still not promising when it comes to internally stored research output accessible through their IRs, which is partly due to a lack of information and communications technology (ICT). Literature has shown that some problems that IRs face in fulfilling their purposes are a shortage of staff, a lack of skilled staff to manage the processes of IR and HTML commands for DSpace. UNISA is considered to have the largest number of collections in its IR compared to other institutions in South Africa. South African universities need to be strengthened to foresee trusted digital preservation when it comes to conforming to the attributes of trusted digital repositories in the context of digital preservation. Scholars agree that institutions of higher learning still need to strengthen their IRs in the digital preservation of records (Masenya & Ngulube, 2018; Wyk & Mostert, 2014; Kanyengo, 2006; Ngulube, 2012; Nkosi, 2008; Olivier, 2007; Van Deventer & Pienaar, 2008; Van der Merwe & Kroeze, 2008).

According to the literature, universities in Africa, particularly in South Africa, continue to lack a broader understanding of digital preservation. The review of literature further revealed that universities in Zimbabwe also revealed low depositing of scholarly materials in the IR. The study further revealed that most staff members who are considered to be contributors to IRs in various institutions of higher learning, particularly those that focused on actual research, do not understand why they should deposit their works or scholarly work into the IR due to the lack of funding and the political situation (Nyambi & Maynard, 2012). It is evident that institutions in Africa, including South Africa, still do not meet the global standards with regard to digital preservation. Keakopa (2006:35) notes that the long-term preservation of digital records is still a challenging task and is one of the unsettled issues related to the impact of ICT applications in record-keeping. Further to that, Jain and Mnjama (2016:158) and Sambo, Urhefe and Ejitagha (2017:120) also state that digital preservation of born-digital records includes the following problems and challenges: the lack of knowledge, shortage of adequately trained personnel to handle digital records, insufficient funding for human and physical resources required to establish and maintain the programs, and the technological obsolescence and fragility of storage media. Hence, the fundamental that underscores digital preservation is the requirement that it is compulsory to maintain the ability to display, retrieve and use digital collections in the face of a rapidly changing technological era relating to organisational infrastructure and its elements (Kalusopa:168).

According to the International Records Management Trust (IRMT) (2009:23), the preservation of digital records consists of preserving the capability to recreate a valuable product, which facilitates the flow of information created throughout its entire lifecycle. Kalusopa and Zulu (2009:105) note that aspects that relate to a policy framework, like policy guidelines guiding the functionality of the digital collection, are urgently needed, as it would facilitate the process for long-term digital preservation of digital records. RGL Mountain (2002) also states that for institutions to be more efficient and effective in dealing with the process of long-term digital repository, they require wide adoption of policies and procedures through the use of web 3.0 or web 4.0 when distributing information on institutional repositories.

Institutions are required to have a strategy in place that goes along with parameters of trustworthiness of the information being digitised and includes authenticity in the process. This leads to digital curations being one of the key components requiring adoption when dealing with IRs. Curatorial responsibility permeates the entire life cycle of a digital object

by formulating strategies, actions, policies, procedures, resource allocation, preservation methods and technologies (ALA, 2018; Beagrie & Jones, 2008). Therefore, digital preservation of IRs can be categorised differently from long-term digital preservation, medium-term digital preservation, and short-term digital preservation (Ruusalepp & Dobreva, 2013). Scholars such as Kanyengo (2006), Ngulube (2012), Van Wyk and Mostert (2014), and Sigauke and Nengomasha (2011) also deliberated on various challenges involved in IRs in most institutions and organisations throughout Africa. Masenya and Ngulube (2018) state that challenges relating to the preservation of information are not addressed the way they are supposed to be addressed and they might lose them if the necessary measures are not taken. It was also noted that libraries are now taking a toll when it comes to the implementation of the digital era (Council of Canadian Academies 2015). However, as Becker et al. (2009) point out that is critical in the pursuit of long-term authentic information transmission that ITs must be trusted. This criterion highlighted the need for a trusted digital repository (TDR), whose aim is to offer its designated community dependable, long-term access to digital content today and in the future (RLG-OCLC, 2002).

In order to manage and preserve scholarly outputs in their libraries, the majority of academic institutions in South Africa built IRs (Van de Venter & Pienaar, 2008). UCT Law Space (Department of Law), UCT Computer Science Research Document Archive, Department of Manuscripts and Archives at the library, and open educational resources, for example, have all implemented IRs (Macha & De Jager, 2011). In 2005, the Carnegie Corporation of New York gave the UCT library, along with the libraries at the University of Witwatersrand and the University of KwaZulu-Natal, a $2.5 million grant for a three-year project aimed at promoting research and library staff development at these universities (Macha & De Jager, 2011). As a result, numerous sorts of digital materials have been digitised and made publicly accessible, according to Masenya and Ngulube (2021). Open-source software like DSpace, ETD-db and Eprints are used in the IRs to manage and preserve digital scholarly outputs such as scholarly publications, pre-prints, post-prints and digital versions of theses and dissertations. DSpace is the most widely used programme that implements both the OAIS reference model and the Open Archives Initiative's (OAI) Protocol for Metadata Harvesting (OAI-PMH) in South African institutions. Academic institutions utilise DSpace to capture, store, index, preserve and redistribute their research materials in digital formats (Tansley, Bass & Smith 2003). Therefore, the curatorial responsibilities that permeate the entire life cycle of digital objects in the digital repositories are required if information held in IR is to be preserved and their long-term accessibility is to be guaranteed at all times.

Future directions or recommendations on how to imbed digital preservation content into IRs

According to the literature, most of the academic institutions in South Africa built IRs to manage and preserve scholarly outputs in their libraries (Van de Venter & Pienaar, 2008) and to provide a central storage location for the institution's intellectual production and boost visibility of research output (Masenya & Ngulube, 2021). It was also noted that new methods and technologies were being developed in academic libraries to enable these institutions to generate, capture, classify, store, preserve, track, and retrieve digital resources in any format. In this regard, DSpace, Innovative, I-T, Archivematica, Rosetta, Fedora, E-prints, Greenstone and Tesella were just a handful of these technologies that were mostly used by universities in South Africa and other parts of the world.

As per the findings, academic institutions were employing systems and technologies appropriate for their budget and the digital content to be preserved in South Africa. On the

other hand, Manaf (2007) points out that a well-established infrastructure is important in ensuring that crucial digital documents are archived and stored for long-term access. Masenya and Ngulube (2021) add that the digital preservation unit's system designers should build or develop technologies that facilitate long-term preservation in support of IRs.

The preservation and accessibility of theses and dissertations are considered one of the factors leading to the establishment of IRs in most parts of Africa, which have grown to include various types of scholarly materials such as peer-reviewed articles, indigenous or traditional knowledge, research, and publishing. According to Sejane (2004:124), there is an urgent need for archival institutions to formulate digital preservation policies. Academic institutions in South Africa should also take into consideration technological advancements in order for entities to be shifted to newer systems as needed to avoid technological obsolescence. These institutions must also develop procedures that allow for the determination of authenticity based on the reliability of the digital entity's source, as well as the methods and technology required to preserve them over the long term. To assist the safety and security of digital materials from unauthorised access, security policies should be implemented.

The study concluded that most institutions in South Africa had attempted and improved on the implementation of institutional repositories, but more effort is still required when it comes to curatorial responsibilities and long-term digital preservation. The challenges that need addressing include a lack of skilled staff operating IRs, resources to capacitate the digital preservation process and practical experience for them to interact with the system. Therefore, training is still required by those that deal with IRs, and resources are also needed to support the operations of IRs. In addition, conference attendance and workshops by staff managing IRs are also encouraged.

Conclusion

The IR in most parts of Africa remains the most decisive tool that enables the functionality of most institutions despite occasional depositing and usage of scholarly materials. The study was successful in identifying the major role of IRs in South Africa and the world. Many challenges were identified that affected IRs like skilful people to accomplish the functionality when it comes to the digitisation of IRs and resources to capacitate the digital preservation process and practical experience for users to interact with the system. Therefore, training is still required by those that deal with IRs, and resources are needed to be able to fulfil the necessary measures concerning IRs and the flow of information. Continuous workshops should be provided to an institution of higher learning and archivists should attend more conferences to obtain exposure to how others overcome the challenges that IRs in intuitions of higher learning face.

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