HOW VISIBLE ARE WE REALLY?

A sociotechnical exploration into the sustainability of digital scholarship collections.

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Abstract

Over and above quality teaching and learning, the status and prestige of higher education institutions depend on the quality, web visibility and accessibility of their research and scholarly communication. Universities and higher education institutions are knowledge intensive environments. Research and scholarship created here are institutional knowledge capital and must be managed as assets, allowing the institutions to derive a competitive edge in research and improved institutional stature. As such, knowledge capital must be managed in a way that will ensure return on investment. Scholarship found in dissertations, theses, proceedings and publications form part of this knowledge capital. Digitised institutional repositories are the preferred method for showcasing scholarship on the internet, thereby adding to the institution's web visibility.

Research repositories developed over the past twenty years to become sophisticated networked digital research collections. Traditional research institutions reap benefits from showcasing scholarship digitally in open access repositories, and peer reviewed academic journals. Institutions with well-developed repositories rank consistently higher

on webometric ranking sites, such as Ranking Web of Universities. However, not all higher education institution sectors have benefited equally from repository and scholarship curation developments. Globally, recent research indicates that valuable research output originates from both public and private higher education institutions, but these are not archived and curated sustainably in all circumstances. Web analysis indicates that research done in some comprehensive- and universities of technology, as well as most private higher education institutions in Southern Africa lack web visibility and discoverability. Coincidentally, Southern African private higher education institutions rank significantly lower than comparative public counter parts. Poor scholarship curation and lack of research visibility deter these institutions from taking their rightful place in higher education and higher education research communities. Where research collections are not managed sustainably as knowledge capital, full return on investment will not be possible.

Previous reported research focused mainly on technical processes of scholarship curation, and not so much on knowledge management aspects impacting on sustainable curation practices. Building on previous research results, this paper explores a sociotechnical approach to improved sustainability of scholarship curation. This study investigated digital scholarship curation trends in a purposefully selected target group of private and public higher education institutions in Southern Africa. Empirical questionnaire results were triangulated with corresponding webometric ranking analysis pertaining to the target group. Identified gaps in current scholarship curation trends explain the poor web visibility in the target group. Results confirm that there is a lack of awareness and knowledge regarding scholarship curation in the target group. Findings are that particularly private higher education lack understanding of how scholarship curation in open access repositories can benefit their institutional stature and reputation. These trends are reflected in data analysis of these institutions on web ranking databases, where private institutions rank significantly lower. Although public higher education institutions in the target group ranked higher on webometric databases than their private counter parts, here too serious sustainability risk factors have been identified in managing their scholarship in digital research repositories.

Based on the results of this study, this paper offers a different model towards the sustainable management of digital scholarship, moving forward from mere technical, content and information management approach to incorporating knowledge management principles where relevant institutional social groupings align and integrate with the support of high level governance. The sociotechnical model offered in this paper, identifies a sustainability domain for scholarship curation. The model explains how all institutional levels need to cooperate, thereby adding to the institution's improved web visibility. The reported findings of this study aim to assist institutions to improve curation practices and policies.

Introduction

Higher education institutions are knowledge-intensive environments. Research and scholarship created here are institutional knowledge capital and must be managed as assets to give the institution a competitive edge in research and academic stature. Knowledge capital must therefore be managed in a way that will ensure return on investment. Digital scholarship such as dissertations, theses, proceedings and publications form part of the knowledge capital created in higher education institutions. The curation of digital scholarship refers to the management, archiving and preservation of digital data over the lifecycle of the data (Yakel, 2007: 335).

The digital curation of scholarship must add value to existing knowledge and assist in creating new knowledge. Sustainability of digital collections and services, such as institutional repositories, are defined by Rieger (2011) as the ability to secure access to all resources needed to protect, maintain, develop and increase the value of a product's content and the service it has for the user thereof. Anbu (2007) adds to this definition by stating that sustainability must include long-term preservation and curation of content and services in the institutional repository context of the definition. Sustainability is thus seen as surpassing mere successful implementation and content management of an institutional repository. Sustainability in institutional repositories and digital scholarship curation requires a socio-technical approach, where decision-makers must realise its

value and align technical and financial operations in support of scholarship curation (Rieger, 2011). Institutional repositories must expand and develop to satisfy the environmental (academic) and socio-cultural (research cultural) needs of the higher education institution. The sustainability of institutional repositories poses challenges in institutions where the value of knowledge capital is not realised. Knowledge capital in the form of scholarship must be purposefully and strategically supported by policies, processes and strategies on a high level of management. In some Southern African higher education institutions, especially private higher education institutions, sharing data in open access is slow.

There are 35 institutional repositories in Southern Africa registered on OpenDOAR (OpenDOAR, 2016). Public higher education institutions have most of the registered institutional repositories in Southern Africa. The main problem that will be addressed in this article is to report why the management of digital scholarship appears to be underdeveloped, in terms of lack of visibility, ranking and open access to research in South Africa. The article will explore how the application of information management and knowledge management principles should be applied in the sustainable curation of digital scholarship, which in turn will reverse the current state of affairs of low ranking educational institutions and poor access to scholarship.

African higher education institutions need to develop their own e-strategies to provide the framework needed to establish digital repositories and so doing create a mandate for African digital scholarship. Without the virtual research environment in an institution the digital data curation cannot take place.

Digital Scholarship

Most higher education institutions in the developed world have fully incorporated and adapted to e-learning and digital scholarship. Lack of access to information and technology has a profound negative effect on the African digital scholarship. Mutula (2009) warns that Southern African higher education institutions that neglect to deploy

e-learning and e-research in their institution do it at their own peril. Collaborative research cannot take place without digital scholarship curation.

Digitised institutional repositories databases developed rapidly during the past ten years in most higher education institutions in the developed world (Smith, Barton and Branschofsky, 2003). Institutional repositories projects cannot develop in isolation and should support the aims and objectives of the educational institution as a whole. Digital scholarship is a networked, scholarly or academic environment extensively integrated with digital and information technologies in teaching and research (Mutula, 2010).

The whole of Africa still only has only 5% of the global total of institutional repositories (OpenDOAR, 2015; OpenDOAR, 2016). The first developments towards electronic submission, storage and dissemination of theses and dissertations in Southern Africa date back to the early 1990s (Lor, 2005), followed by the establishment of the South African Research Information Services (SARIS) project which aimed at providing a framework for e-research services to all South African researchers (Van Deventer and Pienaar, 2008). Mutula (2008) laments the fact that African higher education institutions perform poorly in global web rankings because researchers publish in low impact journals with no internet links and states that 80% of African higher education institutions suffer from no or poor internet connection.

Institutional Repositories and Open Access

Developments to promote access to research in the open access environment resulted in the creation of a number of treaties and agreements such as the Bethesda Open Access Statement (BOAI) in 2001 and the Berlin Declaration of 2003. The value of open access was communicated and encouraged and soon became the norm in institutional repositories. Awareness of the importance of open access research grew and gradually more institutions worldwide, and in Southern Africa, joined open access initiatives and movements by signing treaties and advocating open access. Recently, the value of open access was communicated and encouraged and soon became the norm in institutional repositories.

Cullen and Chawner (2010) report that institutional repositories are created with great initial enthusiasm, but it soon becomes just another task to be done. Generally, the focus in institutional repositories was on improving dissemination of digital scholarship and wider impact of research (Ball, 2010). Ball (2010:5) mentions that institutional repositories were not initially tasked with preservation responsibilities, but as the content of repositories evolved to include more aspects of scholarship than just being a temporary storage until papers or research were officially published in mainstream publishing, this function became increasingly important. Digital curation and preservation need to be planned and managed with great care.

Information and Knowledge Management in Digital Scholarship Curation

Chaffey and Wood (2005) stress that information and knowledge are increasingly valued as 'capital' in both business and higher education institutions. Rowley (2000) maintains that institutional knowledge must be embedded in knowledge management. Rowley (2000) gives these descriptions for the total knowledge existing in higher education institutions and not just scholarship. Scholarship and digital scholarship repositories are, however, seen as important subsets of the sum of all knowledge assets in higher education institutions.

The challenge of achieving sustainability lies not only in the institutional repository project itself and how information and data are managed, but also how the project relates to the bigger higher education institution's objectives. Sustainability of institutional repositories is dependent on how knowledge is seen, valued and managed on all higher education institution operational and decision-making levels. Effective sharing of knowledge created at higher education institutions remains a challenge. Higher education institutions are knowledge-intensive organisations and their relevance and success depend on how knowledge is created, managed and communicated. There are higher education institutions, such as a growing number of Australian (Blackman and Kennedy, 2009) and Japanese higher education institutions (Tian, Nakamori and

Wierzbick, 2009), that do value knowledge as a strategic asset with capital value, and valuable lessons can be learnt by studying trends.

Mutula (2007:396) posits that knowledge management transforms into new products and innovations. It is evident that this process must be managed on a continuum in order to produce consistent and constant innovation. Sustainability of institutional repositories is dependent on how knowledge is seen, valued and managed on all higher education institution's operational and decision-making levels. Blackman and Kennedy (2009) say that traditionally higher education institutions and their governance structures, such as councils, were hesitant to plan strategically. They state that there is often lack of knowledge management strategies. The research of Tian, Nakamori and Wierzbick (2009) into Japanese institutional repositories confirms the views of Kennedy and Blackman. They state that effective sharing of knowledge created at higher education institutions remains a challenge. The role that institutional repositories should play in the management and curation of knowledge capital still needs to be formalised in policy and strategy by higher education institutions' decision-makers and governance processes. Jelavic (2011) posits that not only is knowledge management in institutions critical for success, but that it should focus on the interrelatedness of the human element with the technical.

Research Methodology

This study employed triangulation to evaluate empirical survey results against trends on webometric ranking sites. Berg cites Denzin (2009) who says that each research method reveals various and different aspects of the empirical reality, and for this reason it is best to use triangulation methods (Berg, 2009). Best (2012: 276) states that triangulation was first used by Webb in 1966, and the benefits that triangulation offers, are often the main reason why researchers use this mixed method approach.

The mixed methods research methodology of this study targets 16 purposely selected Southern African IRs as focus areas to observe their scholarship web presence and trends in scholarship curation. According to Best (2012: 267), mixed methods research

stems from pragmatism and is seen to strengthen the study by interrelating qualitative and quantitative methodologies (Best, 2012). Data analysis in mixed methods research allows for quantitative analysis of descriptive and inferential statistics. Researchers could also make use of data his study made use of both quantitative and qualitative research, therefore a mixed methods approach were used. Qualitative research, however, results in more in-depth studies; it takes longer and the objectives or research questions need to be clear. Qualitative research refers to the nature of things (Berg, 2009).

Ranking Web of Universities was used to identify higher education institutions ranking below the top 500 global ranking universities and not included in the African top ten institutional repositories on Ranking Web of Repositories. The target group included 16 public and private higher education institutions in Southern Africa, offering post-graduate qualifications and creating scholarly communication in the form of research (see table 1.). For the sake of confidentiality the respondents in the public sector is referred to as A1-8, and in the private sector as B1-8. To further ensure anonymity rankings are supplied in intervals of 10 in Table 1 below.

Table 1. World and Sub-Saharan ranking of HEIs in the target group (Ranking Web Universities, May 2016

HEI	**Type**	**Ranking Universities**	**World ranking falling between intervals of 500**	**Sub-Saharan ranking falling between intervals of 10**
A1.	Public	Yes	3500-4000	50-60
A2.	Public	Yes	3000-3500	40-50
A3.	Public	Yes	500-1000	10-20

A4.	Public	Yes	3000-3500	40-50
A.5	Public	Yes	2500-3000	20-30
A.6	Public	Yes	6500-7000	70-80
A.7	Public	Yes	4000-4500	60-70
A.8	Public	Yes	7000-7500	90-100
B.1	Private	Yes	4500-5000	60-70
B2.	Private	Yes	9500-10000	120-130
B.3.	Private	Yes	15000-15500	200-210
B.4.	Private	Yes	7500-8000	90-100
B.5.	Private	Yes	12500-13000	170-180
B.6	Private	Yes	21500-22000	250-260
B.7	Private	Yes	15500-16000	280-290
B.8	Private	Yes	16500-1700	390-400

Catell and Fernberger, as cited in Jacobs (2010), researched the systematic use of bibliometrics and laid the foundation for further research. The mixed method used in this study included webometric analysis of the target's group web visibility and performance. Webometrics is a subset of bibliometrics. Bibliometrics is a scientific tool to measure research output (Jacobs, 2010). Jacobs reports that Eugene Garfield's science citation index made analysis of research possible. There are three types of bibliometrics, namely descriptive, relational and evaluative bibliometrics. For the purpose of this study, evaluative bibliometrics is important, as it is a tool to assess the impact of scholarly work, as well as the quality of digital scholarly contributions to open access collections.

OpenDOAR and Web Ranking of Repositories are authoritative examples and sources of reliable institutional repository statistics and performance monitoring worldwide. Webometrics analysis and institutional repository content analysis were used to gain deeper insight into the data collected from survey questionnaires. Analysing this data against webometric rankings gave insight into the inherent sustainability or lack thereof in the target group. For this study, quantitative data was collected from completed empirical survey questionnaires. Kim and Kuljis (2010:369) refer to content analysis as a useful qualitative methodology to examine web-based content.

Sixteen questionnaires were sent out and 10 completed questionnaires were received back. The feedback ratio on completed questionnaires was 62.5. The credibility of the research was measured by the Cronbach Alpha Coefficient and the scale employed was 0% to 100%, with a higher percentage indicating a higher credibility rating. An overall coefficient of 74.25% was calculated for the results obtained and this is considered to be in the range of scores regarded as reliable.

Data analysis of Ranking Web of Repositories

Fifty-two Sub-Saharan institutional repositories are registered on Ranking Web of Repositories. Nine of the top ten repositories are situated in South Africa. The top ten are all from public universities. The top ten institutional repositories were explicitly excluded from this study, as the assumption based on their ranking and OpenDOAR profiles is that they are well funded, planned and managed. The ranking of top institutional repositories correlates with the ranking of top universities. Nineteen institutional repositories on Ranking Web of Repositories are registered in South Africa, two in Namibia, one in Botswana and four in Zimbabwe. The higher education institutions selected for this study were all ranked on the Ranking Web of Universities site, but the question was whether they were ranked and correlated as the top 10 higher education institutional repositories. Figure 1 presents a comparison of ranking positions of respondents. Five of the 16 institutional repositories chosen for this study were ranked on Ranking Web of Repositories. Only one private higher education in this target group institution’s repository was ranked. In total, six repositories in the target group

were ranked, comprising 37.5% of the target population. Of all the institutional repositories in the target group, 62.5% were not ranked on Ranking Web of Repositories, indication poor web visibility to research.

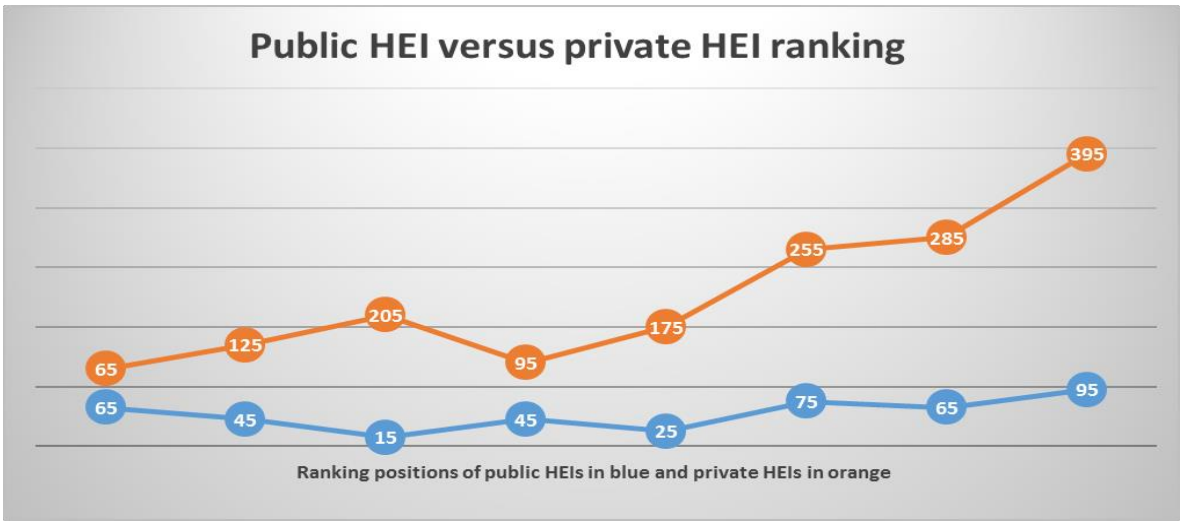

Figure 1. Public versus private HEIs on Ranking Web of Universities (2016)

OpenDOAR Content Analysis

Seven of the 16 institutional repositories in this study are registered on OpenDOAR. Only one private higher education institution is this study is registered on OpenDOAR. Although all respondents indicated the benefits of open access and stated that adherence to open access standards was beneficial, 65% of the target group were not registered on OpenDOAR. Although respondents indicated their participation and appreciation of scholarship in open access, content analysis on OpenDOAR reveals that only three of all the higher education institutions in the target group supply metadata standards information. The absence of reputable academic harvesters has a seriously negative impact on web visibility and is one of the reasons for low ranking and low impact. Findings indicate that respondents in this study are not OAI-compliant. The OAI Protocol for Metadata Harvesting (OAI-PMH) is a machine-to-machine interface provided by most repository software platforms (OpenDOAR, 2016). OpenDOAR offers clear guidance on how these policies can be added and also explains the benefits they have for increased web visibility.

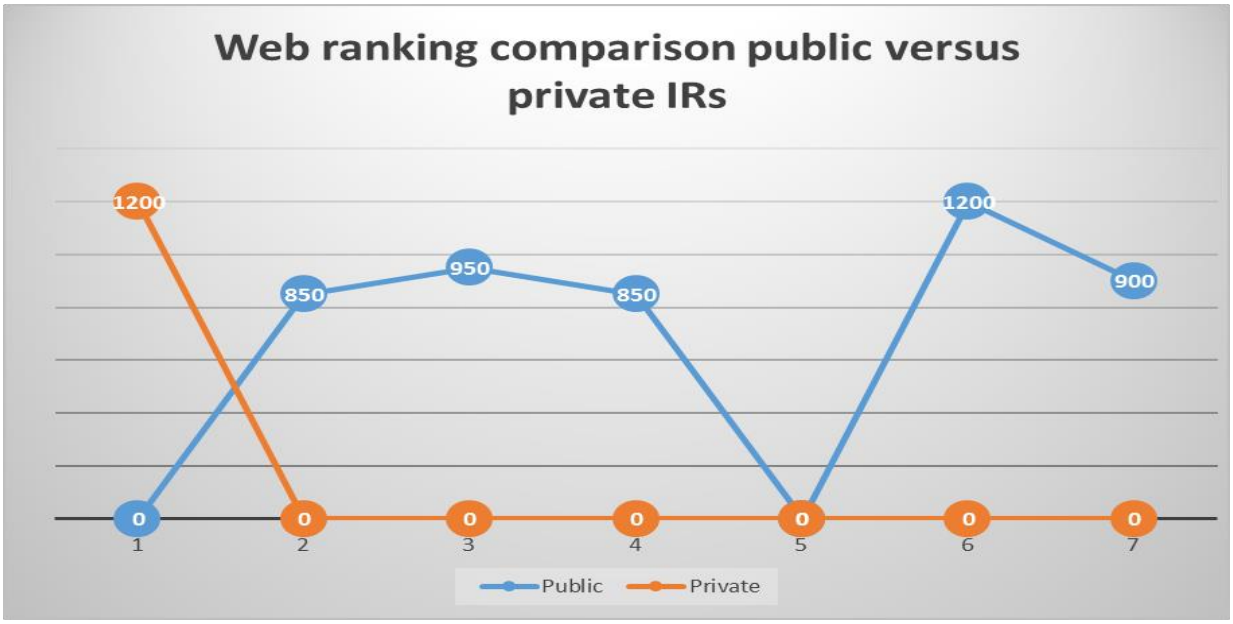

Figure 2. A comparison between web rankings of private and public HEIs: Sub-Saharan ranks on Ranking Web of Repositories (2016).

Research Findings of Empirical Quantitative Questionnaires

Nature of Scholarship Production and Curation

All of the ten respondents indicated that both post-graduate students and academic staff members produced scholarship and communicated this scholarship via academic research platforms and publications. Seventy-five per cent (75%) of the private higher education institutions in the target group had scholarship in dissertations and theses, housed in repositories, while the rest housed scholarship in journals. All the public higher education participants indicated that they have established digital repositories for showcasing their scholarship.

Strategies for Sustainable Curation of Scholarship and Research Output

Only fifty per cent (50%) of higher education institutions had a research strategy, IT strategy and an open access strategy. Ninety per cent (90%) indicated that they did not have a knowledge management strategy in place. This corresponds with the study by Blackman and Kennedy (2009), stating that higher education institutions are generally slow to take up knowledge management strategies, despite the potential benefits. Of the existing institutional strategies those in private higher education institutions were less developed. Chakravarty and Wasan (2015) warn that where the institutional repositories performance is too low, policies and strategies must be reviewed to increase the volume and quality, making information management strategies a critical component of sustainable developments of institutional repositories (Chakravarty and Wasan, 2015:4). Only one respondent from a private higher education institution indicated that the institution had an open access policy in place. Recent global studies into the research role and activities of private higher education institutions have been showing an upward trend in open access policies in higher education institutions (Thuraisingam, Hakan Parvinder, David and Nair 2014; Casani, De Filippo, Garcia-Zorita and Sanz-Casado, 2014). The results of this study indicate that Southern African higher education institutions are not yet on par with global trends. It indicated that especially private higher education do not fare well in giving access to their scholarship.

Institutional Governance and Scholarship

Having strategies in place does not ensure best practice. Policy and procedure documents should be aligned with all higher education institution strategies. The nature of policies affecting scholarship and research output and communication in the target group resulted in only 50% of respondents stating that institutional repository policies were in place. Only 20% had an open access policy in place. According to the answers, no one had a research information management strategy policy in place, indicating that the institutional repositories in the target group were not staying abreast of innovations.

Scholarship Curation, Policy and Procedure

Tian, Nakamori and Wierzbicky found in their 2009 study at a Japanese university that the biggest stumbling block in establishing knowledge management for the enhancement of research knowledge creation lies in the lack of higher education institution governance recognition, as well as their understanding and support in scholarship curation (Tian, Nakamori and Wierzbicky, 2009:90). Forty per cent (40%) of the target group indicated that their library committee is the only governance body making decisions on institutional repository policies. Most of the private higher education institutions reported other, but similar, structures such as research boards or joint committees.

Knowledge Management in Scholarship Curation

In the absence of a knowledge management strategy as reported in the target group, the study needed to ascertain if knowledge management concepts were addressed in existing policies. Only 26% of respondents referred to knowledge management in their existing policies and only 27% acknowledged scholarship as knowledge or intellectual capital in their policies. Research on knowledge capital was still largely undefined in the target group. In a related study conducted in 13 countries, Lagzian, Abrizah and Wee (2015) found that institutional repositories could not be managed successfully without good governance policies, plus managerial directive and support (Lagzian, Abrizah and Wee, 2015:201). From their study on knowledge management strategies in a Bangkok university, Blackman and Kennedy (2009:143) summarised that socio-organisational as well as knowledge management factors remained critical in designing and developing a learning environment conducive to knowledge creation.

Value, Trust and Quality of Scholarship Curation

Seventy per cent of respondents felt they were informed about all research related to digital projects in their respective higher education institution. Eighty per cent of respondents were of the opinion that digital curation in institutional repositories should be a centralised function in the higher education institution. Sixty per cent of respondents reported that their higher education institutions supported and funded

research production. Forty per cent were of the opinion that research was secondary to teaching and learning at the higher education institution. This corresponds with a study done in 2014 in Malaysian private universities by Thuraisingam *et al.* (2014), where they found that the research culture was not well established, and research and knowledge creation were indeed secondary to teaching and learning.

Table 2. Research Repository Visibility, Interoperability, Preservation and Openness

Awareness, visibility, advocacy	**YES**	**NO**	**NOT SURE**
Research repositories and scholarship collections are general knowledge to all staff, researchers and students	60% (6)	30% (3)	10%(1)
The research/scholarship repository is visible and accessible on my institution's website	80% (8)	20%(2)	0%(0)
There are regular calls for participation and contribution of research output created for submission to the repositories	40%(4)	40% (4)	20% (2)
IR networking and openness	**YES**	**NO**	**NOT SURE**
My institution/ university/ college's research is freely available in the open access	80% (8)	20% (2)	0% (0)

environment			
My institution/university/ college actively promotes and takes part in initiatives such as Open Access week, NDLTD and other research repository networking opportunities	80% (8)	10% (1)	10% (1)
Researchers at my institution are aware of the benefits of publishing in open access	20% (2)	40% (4)	40% (4)
IR preservation, curation and interoperability	**YES**	**NO**	**NOT SURE**
Do you have a long term preservation strategy for your digital records?	50% (5)	40% (4)	10% (1)
Are you subscribing to standards for web content interoperability such as OAI-PMH, and OAIster in your digital repository?	50% (5)	40% (4)	10% (1)

Institutional Repository Relevancy in Higher Education Institutions

Eighty per cent of respondents answered in the affirmative and felt that their management and governance structures were informed about scholarship collections. On the question whether budgeting and separate funding for institutional repositories were in place, 60% of respondents indicated that there were no separate budgets. Fifty

per cent of public higher education institutions and 90% of private higher education institutions did not have a separate budget for institutional repositories. One respondent from a public higher education institution indicated that an allocation was made on the general library budget. The level of integration of institutional repositories with other institutional and research-related activities, systems and projects is an indicator of both success and sustainability. Interdepartmental collaboration in forums/committees, where all stakeholders are present and participate meaningfully, is an indicator of success: 60% indicated that this was not occurring in the institutional repository management structures. Two private higher education institutions indicated that their institutional repositories were managed by a range of collaborating professionals sharing expertise; these made up 20% of the total responses.

Constant development and innovation are requirements for success and development. Respondents indicated that new developments such as RIMS (research information management system) and digital scholarship collections were jointly planned and managed: only 20% indicated that these innovations were happening. Rieger (2011:250) stressed the importance of constant innovation and alignment with institutional developments as a critical factor in the sustainability of institutional repositories. Sixty per cent of all respondents feel that their institutional repositories are well known in their institution and research community. Eighty per cent of respondents indicated that their scholarship collections were visible on their websites. However, content analysis on OpenDOAR indicates that even though scholarship is available on the websites, web visibility is compromised where open access harvesting and interoperability standards are not adhered to and implemented (OpenDOAR 2016).

To a question on whether regular calls for participation and contribution of research output for submission to the repositories were made, 40% of respondents answered that proactive efforts were made to populate their institutional repository (see Table 2). This leaves 60% of the target group open to random and inconsistent contributions by researchers' and students' scholarship to be curated in an organised and controlled way. Fifty per cent of repositories have a long-term preservation plan in place, but 40%

have no preservation plans in place. After successful implementation, successful performance monitoring of institutional repositories growth and usage is cardinal for successful management of institutional repositories. Twenty per cent of respondents indicated that they were aware that their IR was ranked on Ranking Web of Repositories. Thirty per cent indicated that they were not ranked, and another thirty per cent were not sure. Fifty per cent of respondents indicated that there had been clear development of their institutional repository. Forty per cent indicated that there were no plans for maintenance and development. Despite low rankings, limited web visibility and lack of innovation; 80% of respondents felt that institutional repository managers were suitably skilled. Sixty per cent of respondents were using an open source software package to run their institutional repositories. Seventy per cent of respondents indicated that their software had been upgraded during the past three years.

A Sociotechnical Model for Sustainable Scholarship Curation: Towards Improved Web Visibility

In 2011 Jelavic presented his knowledge management synthesis model as foundation for an institutional knowledge management system. He explains how different groups within the same institution interact with technology in different ways, and on different levels, based on their function in the institution. They become the sum of the parts of institutional knowledge management on a sociotechnical level, where sociotechnical knowledge management spheres of infrastructure, infostructure and infoculture are interrelated. His model was adapted, and combined with that of Sadler's 1998 sustainability triad as cited by De Oliveira and Rodrigues (2010: 806), to graphically illustrate the processes and groupings that will ultimately determine sustainability of IR processes and scholarship curation. Where these three spheres overlap, and in practice cooperate and align with related areas in the institution, scholarship curation has the best chance to be managed, survive and develop sustainably over time. The model in Figure 3 proposes that scholarship curation be monitored on an institutional governance and strategy level, opposed to restricting management of scholarship curation to a department, such as the library. Here, the repository can align strategically with institutional strategy and the probability of stagnation and side-lining is reduced. The

principle of research in open access and openness forms the foundation of this model, which would see the institution adhering to interoperability standards, participating in open access networks and initiatives.

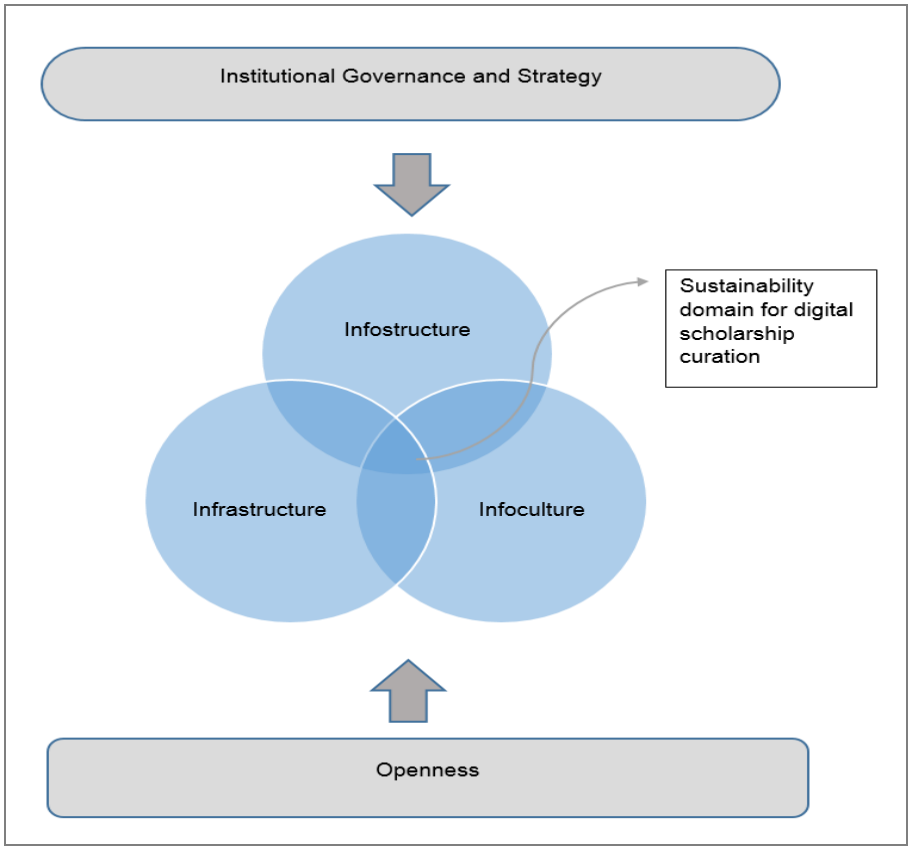

Figure 3. A sociotechnical model for sustainable scholarship curation

From the findings of this study a definition for the sustainability domain for a higher education institution scholarship curation in open access digital repositories can thus be described as:

> *That functional area where a higher education institution succeeded to strategically and purposefully manage, align, and integrate its relevant human capital, resources, operations and technology to ensure optimal*

and continued discoverability of networked scholarship, where the institution acknowledges and treats scholarship, as valued and trusted intellectual and knowledge capital, archived and curated in a research repository with a return of investment as one of its aims.

Conclusion

The main aim of this article, and the study, was to identify and evaluate trends in digital scholarship curation in a purposefully selected target group. Participants in this target group were chosen for their existing web visibility and level of scholarship creation. Despite the fact that higher education institutions are knowledge-intensive institutions, where new knowledge is constantly created, researchers agree that knowledge management in higher education institutions in the form of knowledge management strategies, policies or even knowledge management awareness and conceptualisation is surprisingly rudimentary in most higher education institutions.

The empirical study reveals a number of gaps affecting the effectiveness of institutional repositories in higher education institutions in the target group. Gaps were identified in terms of a true understanding of the nature and importance of interoperability in open access. Collaboration within the higher education institution to share expertise, as well as external networks, are lacking. Although respondents were of the opinion that institutional repository staff were well qualified, and that their higher education institution was supportive and knowledgeable about open access, however, triangulation with webometric analysis and the ranking of institutions in this target group indicated the presence of sustainability risk factors that had a negative impact on institutional and repository ranking. When triangulating the findings of the questionnaire survey results with recent statistics obtained from the reputable web directory, OpenDOAR, all indications are that the institutional repositories in the target group may be at peril, as serious sustainability threats surfaced.

This research explored how information management and knowledge management principles could improve the archiving, preservation and curation of digital scholarship, ultimately to enhance open access to valuable research produced in Southern African higher education institutions. The research revealed that there is still insufficient understanding and support of scholarship curation at governance level. The study revealed serious gaps in the understanding of open access and application of open access protocols and standards.

Findings are that particularly private higher education institutions need to be brought into the open access scholarship picture. There is lack of awareness and knowledge regarding effective scholarship curation, and the value that web visibility holds for the entire institution. Web performance needs to be monitored to gage effectiveness, and this is not happening. Although public higher education institutions in the target group faired significantly better than their private counterparts, serious sustainability risk factors have been identified in both groups in managing the scholarship in institutional repositories. These risk factors could potentially be eliminated, only when scholarship is valued as intellectual capital it is, and concerted efforts are made to manage knowledge assets sustainably.

Recommendations

The importance of research visibility is not realised by many higher education institutions. The sustainable management of scholarship in digital open access repositories must be prioritised on governance levels. Higher education institutions' rankings, as well as repository rankings, need to be explained and reported to decision-makers and their performance monitored. Knowledge management for sustainability needs to begin at a statutory decision-making level, where the institutional repository is formally recognised, supported and incorporated into higher education institution's governance processes within a sociotechnical knowledge management framework.

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