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The status of the Electronic Thesis and Dissertations (ETDs) outputs amongst the institutional repositories in South African universities: Part 1[1]

Thembani Malapela

Department of Knowledge & Information Stewardship (DKIS), South Africa

tmalapela@icloud.com

Collence Takaingenhamo Chisita

University of South Africa, Department of Information Science, South Africa

chisitacollence@gmail.com

Zanele Hadebe

zanelec@yahoo.com

Abstract

Electronic Thesis and Dissertations (ETD) have been around for more than a decade now and were initiated as a means of collecting, sharing, disseminating, and archiving research outputs from academic institutions. Even before ETDs, institutions of higher learning have been collecting and archiving this type of scholarly outputs manually. While most thesis remain unpublished, this knowledge produced is almost constant as it is (in most universities) a requirement when research students graduate. In sub-Saharan Africa, it has been established that there is low research output when compared to the rest of the world. Yet, there are many universities in Africa who produce post-graduate students who submit ETDs and these are not visible or most never turn into research papers. As in the rest of this world, African universities have established institutional repositories in academic libraries to help preserve the

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[1] Preliminary findings of this work were presented at the QQLM 2019 Conference in Florence, but this paper has never been presented elsewhere or published. The authors are working on the second part of the paper

institution's intellectual property and to increase the institution's visibility (global rankings) and prestige. It is uncommon to have either a dedicated ETD collection in an institutional repository or a stand-alone ETD repository. This purpose of this study was to establish the research output and visibility of scholarly research produced by the higher education institutions in South Africa and specifically focus on the ETDs. This study has both qualitative and employs pre-dominantly the desk-study and intensive literature review. The study discovered that all 23 South African universities have ETD collections and three have dedicated ETD repositories. The rate of deposit does not match the graduation levels and the visibility of these ETD require an institutional priority. The paper concludes by proposing an in-depth survey to understand the emerging issues from this present study. This is the first part of the 2-part study, the second part interviews the ETD managers or repository managers to closely verify the issues raised or discovered in the first part.

Introduction

The appreciation of the important role that higher education plays in the economic development of a country has prompted governments worldwide to increase their funding for scholarship. In South Africa for example, the budget for universities stands at 0.75% of GDP compared with the rest of Africa, which stands at 0.78% (Council on Higher Education, 2016). Universities are viewed as generators of new knowledge and they are expected to produce research that usher in innovations to spur and sustain national development. Investments into higher education in South Africa are through the National Research Foundation (NRF) and the Council for Higher Education. Universities in general are responsible for teaching, learning and research, they are however challenged to produce high quality research that can support the national development agenda.

Universities in South Africa, like their counterparts elsewhere, uphold international standards, for example, before graduation students to submit a properly supervised thesis (or some research works) before graduation. In Sub-Saharan Africa, thesis collections are growing faster than any other scholarly outputs. Many university libraries established online repositories and 'thesis collections' to cater for this growing content. Furthermore, many universities have created and endorsed policies that require students to submit their work under the terms of their institutional repository before graduation. When these repositories are exclusively for thesis, they are known as Electronic Theses and Dissertations (ETDs) repositories. ETDs are regarded as the most effective channels through which theses and dissertations can be made available to academic communities and beyond (Lippincott and

Lynch, 2010:7).

In any discussion of open scholarly output, two routes emerge – Open publishing and Open archiving. With regards to open archiving, open repositories (OR) have existed for more than two decades now, and open repositories have been in various forms, for example, Institutional Repositories (IRs) (collecting all of the institutional intellectual outputs), Electronic Thesis and Dissertations (ETDs), and Open Educational Repositories (OERs). Callicott, Scherer and Wesolek (2016:15) noted that while institutional repositories "are entering their second decade with rapid growth, they are still in their infancy and have yet to reach their fullest potential". Literature has shown that regarding repository software, three core software's have maintained dominance and preference – these are E-Prints, D-Space and Fedora (Burns, Lana, and Budd, 2013). The collection and publication of other forms of scholarly outputs such as research data and open datasets provides an opportunity for repositories to become increasingly central to the publication of scholarly works.

In South Africa, repositories in higher education have maintained a central role. The Directory of Open Access Repositories (DOAR) lists 39 repositories in South Africa and of these 11 are from traditional universities, several universities of technology and comprehensive universities. Similarly, the UNESCO Global Open Access Portal notes that there are 30 OA repositories registered in OpenDOAR. This includes 11 *traditional universities* (or at least their departments), several *universities of technology* (Cape Peninsula University of Technology, Durban University of Technology, Central University of Technology and Tshwane University of Technology), and *three comprehensive universities* (University of Johannesburg, University of South Africa and University of Zululand). Traditional universities offer Bachelor's degrees and have strong research capacity and high proportions of postgraduate students; Universities of technology are vocationally (pracademical) oriented institutions that award higher certificates, diplomas and degrees in technology; and have some postgraduate and research capacity and comprehensive universities offering both Bachelor and technology qualifications, and focusing on teaching but also conducting research and postgraduate study.

Since the demise of the apartheid political system, the South African higher education scene has been radically changing. According to the Higher Education South Africa (HESA) there are 23 public universities in South Africa. The South African Higher Education and Research institutes continue to increase active research in all disciplines, and also to support researchers to produce relevant research. For example, in 2016, the South African Government and the European Union agreed to set up the South African Research Infrastructure Roadmap (SARIR) framework which was conceived as the platform for developing the national research infrastructure needs, for the emerging institutions. SARIR foresaw a number of actions, one of which was to create a national infrastructure that will amongst other things, (i) award free, open access to users selected through a world-class peer review competition, and (ii) ask the users to publish/share their research results in the public domain (Department of Science and

Technology, 2016:8). The commitment to sharing of research outputs in the public domain was thus infused. The present study focused on ETDs and sought to understand the status of open repositories in South African universities and particularly the status of ETDs.

For repositories to operate effectively, there is a need for an operating environment such as necessary policies mandating deposits by students and researchers. Currently, In South Africa, there are 10 policies from South Africa registered on the ROARMAP[2], 8 universities and 2 funder policies. The National Research Foundation of South Africa is one the major funders (and also listed in ROARMAP) in the higher education in South Africa and it has a policy that supports open access from the works it funds. This paper seeks to review the current status of ETD repositories in South Africa and also evaluate the status of deposits. This study aims to examine the contribution of universities to research by focusing on the research outputs. In sub-Saharan Africa, it has been reported that South Africa, Egypt and Nigeria lead in research output (World bank, 2014), however the contribution of ETDs to South African Scholarly output has not been well documented in literature. The fourth industrial revolution provides an opportunity to strengthen the ETD culture in support of scholarship.

Literature Review

As the Open Access movement gained momentum in the 2000s, universities worldwide started setting up repositories in an effort to support free online access to digital scholarly materials (Chisita& Chiparausha, 2019). By 2001, the Budapest Open Access Initiative Declaration had established two options for achieving OA namely: the Gold open access route , in which the publisher provides immediate and unrestricted online access to the final published version at a fee, and the green open access route consisting of the self-archive or deposit of all articles published in traditional journals, on authors' web pages, or in institutional/thematic repositories that are OA either before (preprint) or after (post print) their publication (Miguel, Chinchilla-Rodriguez,& de Moya-Anegon, 2011:1131). The term Open Access (OA) describes a new model for disseminating scientific research publications. It is digital, online, free of charge, and free of most copyright and licensing restrictions", replacing the earlier method of selling journal subscriptions and restricting access to paying readers only (Bo-Christer Björk et al .2014:237). A comprehensive review of the status of Open Access in South Africa was done by Raju, Smith, Gibson and Talliard (2012) and Czerniewicz and Goodier (2014).

Open access' fundamental principle is to make the intellectual output of researchers and their institutions more visible, accessible, harvestable, searchable and useable by any potential user with access to the Internet. For most universities, theses and dissertations form a major part of the IR content, to a greater extent, for example, some authors including

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[2] As of May 2019

(Kettler, 2016: 29) argue that many repositories in fact were built for the purpose of making ETDs available, and in some instances certain universities still maintain dedicated repositories or document servers only for ETDs. Most institutional repositories are hosted within academic libraries around the world to digitally collect and preserve academic papers and Theses and dissertations (Khaparde and Ambedkar, 2014).

EDTs form a good source of research work, as in most cases they are product of research themselves, and when they are made available, they enhance the visibility of an institution's research output. Bandra (2002) enumerated the advantages of ETDs, as follows:

1. Empowering students to convey a richer message through the use of multimedia and hypermedia technologies

2. Enhancing graduate education by allowing students to produce electronic documents, use digital libraries and understand issues in publishing;

3. Increasing the availability of student research for scholars and preserve it electronically;

4. Lowering lower the cost of submitting and handling theses and dissertations;

5. Empowering universities to unlock their information resources;

6. Advancing digital library technology

There has been a number of challenges when establishing repositories, in Africa (in general) Guadagnino (2009) identified the following issues, (i) mistrust and lack of awareness, (ii) lack of budget allocation for libraries and institutions for archiving, and (iii) inadequate technological infrastructure. Regarding the last challenge, UNESCO (UNESCO, 2018) noted with respect to South Africa that, "some organizations still lack capacities to make research results OA – they lack IT support and infrastructure. Non-digital born materials need to be digitized and there are always issues with funding for digitization". As stated, there are 23 Universities in South Africa, the Directory in Africa whereby some are listed on the Open DOAR while others are not.

Webley, Chipepereka and Suleman (2011) noted that major efforts in ETDs started with in mid-1990s, after the creation of the Networked Digital Library of Theses and Dissertations (NDLTD) in Mid-1990s. In South African ETDs were established at Rhodes, Wits and Pretoria Universities late 1990s. Macha and De Jager (2011) noted that the South African Research Information Services (SARIS) project investigated ways in which South African research institutes access and disseminate research. Sparked by this project (via a framework of e-Research services) recommendations, organisations such as Electronic Information for Libraries (eIFL) and the Mellon Foundation provided assistance to universities to set up institutional repositories.

The history of ETDs in South Africa is traced to the University of Pretoria, which started

making their thesis available online in the year 2000 as a pilot project called UPeTD website. Later the library started an IR, by the end of 2002, the repository contained 39 thesis and 26 dissertations. In January 2012 the Webometrics World Ranking of Institutional Repositories ranked the UPeTD website, 69th in the world (Webometrics World Ranking: 2017). The records of UPeTD (after it was discontinued) were migrated to the UPSpace institutional repository in August 2014. The collection is now part of the institutional repository in UP as it is with many other universities in South Africa.

UPeTD is the most remembered ETD initiative and to date many other universities across South Africa have IRs and collect electronic thesis. Later the National ETD Portal (national ETD aggregator) was established as a harvester of Metadata of dissertations and thesis from repositories in South Africa. The National ETD portal was established by the National Research Foundation (NRF) and the Council for Higher Education. Currently the National ETD harvests from 23 University repositories (National ETD, 2018). The purpose of the National ETD portal is to provide access to a country-specific collection of ETDs and to coordinate, manage, monitor and support the development of ETD programmes at the various universities. The portal harvested repositories running from DSpace, Eprints, ETD-db or other software as long as they were using the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH).

Methodology

This study is qualitative and external desk-based (and observation) with the researchers using the research questions below. Desk research refers to secondary data or that which can be collected without fieldwork. According to XXXX any researcher conducting secondary research should scout for reliable published reports. The researchers used the major objective and specific research questions to isolate the specific information they were searching for. The major objective of this study is to establish the status of the research outputs archived and disseminated by South African universities. In order to answer this objective, the study had the following specific objectives expressed as research questions:

- What do these repositories contain? Are ETDs produced in South African Universities accessible via the institutional repositories?
- What is the status of policy environment for repositories in South African Universities?
- Are the institutional repositories exposing ETDs visible over the internet?

To find the answers to these specific questions, a desk study where each respective repositories was examined for the scholarly research contents, the type of contents, the technical aspects of the repository (software, metadata standards, OAI PMH compliant, indexing of contents, deposit policies, copyright policies and institutional OA policies,

etc.(Luyten,2018).The Web Ranking of Repositories was used to study the international visibility rates of each repository under study. In this desk study each ETD visibility of Directory of Open Access Repository (DOAR); the ROARMAP and the Webometrics measurement of visibility of repositories (TRANSPARENT RANKING: Institutional Repositories by Google Scholar service).

Findings and Discussion

Results for RQ1: What do these repositories contain? Are ETDs produced in South African Universities accessible via the institutional repositories?

The research revealed an uneven landscape on the status of ETD collections in South Africa. There are 23 universities in South Africa and all of the universities have ETD collections available online. Only 2 (University of Western Cape and Cape Peninsula Universities) universities still have dedicated exclusive ETD content, while in 21 universities the thesis collections are hosted within institutional repository.

Name of University	IR	ETD
Cape Peninsula University of Technology	√	√
Central University of Technology	√	×
Durban University of Technology	√	×
Nelson Mandela University	√	×
North west University	√	×
Rhodes University	√	×
Tswane University of Technology	√	×
University of Fort Hare	√	×
University of Free State	√	×
University of Johannesburg	√	×
University of KwaZulu-Natal	√	×
University of Limpopo	√	×
University of of Cape Town	√	×
University of Pretoria	√	×
University of South Africa	√	×
University of Stellenbosch	√	×
University of Venda	√	×
University of Western Cape	√	√

University of Wits	√	×
University of Zululand	√	×
Vaal University of Technology	√	×
Walter Sisulu University	√	×

Figure 1. State of ETD collections in SA Universities

In all the above institutions, the repositories are hosted or overseen by the university libraries. Data obtained from South African National ETD Portal shows the size of the ETD collections in the respective universities captured in Fig.1 above.

As of the 15th of May 2019, there were 134,134 ETDs that were deposited in South African universities repositories. The five largest collections are from the University of Cape Town (17,501), the University of South Africa (16,148), the University of the Witwatersrand (15,051), the University of Pretoria (12,370) and the Stellenbosch University (12,216).The least university with the deposit is the Walter Sisulu University with 94 thesis. The size of the thesis collection is influenced by the age of the university, the size of the research student collection and also when the repositories were established in that particular university. Find below in Fig.2 the statistics of the collection per institution as exposed by the South African National ETD portal.

Institution	Total Thesis
Cape Peninsula University of Technology	1,938
Central University of Technology	651
Durban University of Technology	2,582
Nelson Mandela Metropolitan	4,098
North-West University	7,670
Rhodes University	8,150
Stellenbosch University	12,216
Tshwane University of Technology	1,690
University of Cape Town	17,501
University of Fort Hare	1,255
University of Johannesburg	9,729
University of KwaZulu-Natal	9,530

University of Limpopo	2,388
University of Pretoria	12,370
University of South Africa	16,148
University of the Free State	1,202
University of the Western Cape	7215
University of the Witwatersrand	15,051
University of Venda	996
University of Zululand	1,475
Vaal University of Technology	185
Walter Sisulu University	94
Total	**134,134**

Figure 2: The size of ETD collections in institutions in SA

The researchers also visited (March 2019) the specific repositories and discovered that some institutions had issues, for example, the University of Zululand link is not working as it is not possible to access the ETDs (similarly with the Tshwane University of Technology and the Vaal University of Technology.

As noted above student enrolment and also the type of university have an impact on their research outputs. South Africa universities have been classed into 3 genres, as noted above, (i) traditional universities, (ii) comprehensive university and, (iii) university of technologies (there is fourth category is national institutes, explained within the context of higher education landscape). In 2017, it was noted that student enrolment was concentrated in six comprehensive universities which together had more than 300,000 students. There has also been a dramatic rise in postgraduate enrolments since 1995 from 70,000 to more than 120,000 in 2017 (Higher Education in Context, 2017).

Data from the South African Council for Higher Education in 2017 provides a landscape of student enrolment and also research output per institution.

Institution	Graduate Students in 2017	Research Output 2017	ETD Collections 2019

	Masters	Doctorate	Total	Total	Total
University of Cape Town	1139	277	1416	3,113.62	17,501
University of South Africa	931	289	1220	2,673.50	16,148
University of Pretoria	1866	354	2220	4,173.94	12,370
Stellenbosch University	1601	305	1906	3,725.53	12,216
University of the Witwatersrand	1714	283	1997	3,690.58	15,051
University of Johannesburg	679	126	805	2,590.41	9,729
University of KwaZulu-Natal	1125	388	1513	3,984.80	9,530
Rhodes University	235	87	322	1,029.04	8,150
North-West University	813	235	1048	2,605.04	7,670
University of the Western Cape	380	120	500	1,117.98	7,215
Nelson Mandela Metropolitan University	442	92	534	969.08	4,098
Durban University of Technology	147	33	180	487.86	2,582
University of Limpopo	238	29	267	530.68	2,388
Cape Peninsula University of Technology	93	17	110	393.01	1,938
Tshwane University of Technology	300	55	355	718.51	1,690
University of Zululand	86	32	118	357.77	1,475
University of Fort Hare	226	117	343	970.66	1,255
University of the Free State	493	127	620	1,642.22	1,202
University of Venda	173	42	215	469.19	996
Central University of Technology	48	20	68	215.22	651
Vaal University of Technology	40	5	45	181.76	185
Walter Sisulu University	36	9	45	109.08	94

Figure 3: South African Public University Graduate Students and Research output in 2017 (CHE, 2017)

The above data indicates that all 23 universities do have graduate students and each institution does produce a variety of types of research outputs. Mostly, traditional universities (namely University of Cape Town, Fort Hare, Free State, KwaZulu-Natal, Limpopo, North-West University, Pretoria, Rhodes, Stellenbosch University, Western Cape and Witwatersrand) produce higher research outputs and similarly has more graduate students. There seems to be a correlation between the number of graduate students and the number of ETD deposit, the higher the number of graduate students the number of thesis deposited (NB this only illustrative as the ETD figures are not only for 2017).

The data above also indicates an increased potential for ETD collections to grow, as noted in the number of total research outputs. There is a need to establish through disaggregated data the number of thesis per year against the number of graduating students. This will establish how many ETDs are online versus the one approved by Thesis promoters.

Results for RQ2: What is the status of policy environment for repositories in South African Universities?

According to the Registry of Open Access Repository Mandates and Policies (ROARMAP) there are 11 policies deposited from South Africa. From the 11 policies, 8 are South African Universities and these are Cape Peninsula University of Technology (CPUT) Libraries, Stellenbosch University, University of Cape Town, University of Free State, University of Johannesburg, University of Pretoria, and University of South Africa (UNISA) and the University of the Western Cape. Examining these policy terms, 5 of these policies have terms that explicitly specify ETDs as content types covered by the mandates. There is a need to better understand in the 23 universities if there is an administrative requirement on deposit of thesis to the repository at graduation and if such policies are followed.

Results of RQ3: Are the institutional repositories exposing ETDs visible over the internet?

To examine this research question the researchers used the Ranking Web of Repositories to primarily examine the visibility of the institutional repositories[3]. While the service is not in use, it has been replaced by the *TRANSPARENT RANKING: Institutional Repositories by Google Scholar service*. This service uses the indexing of records of open access repositories by Google Scholar. It is important for repository managers to check their level of indexing and focus in identify and solving errors in the metadata description (Luyten,

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[3] The July 2017 edition of the Ranking Web of Repositories was cancelled after discovering many entries with a large number of webpages, exceeding several times the global output of the institution. By 30 October 2017: The Ranking of Repositories has been cancelled definitive.

2018). Using the May 2019 edition, we could establish the visibility or ranking of the South African Repositories in the top 1000 from the world.

World Ranking	Repository	Google Scholar Records
127	University of Pretoria Repository	23,000
147	OpenUCT University of Cape Town	20,800
181	Stellenbosch University Scholar Repository	17,700
188	University of Witwatersrand IR	16,900
662	University of Western Cape Thesis and Dissertation	4840

Figure 4: Transparent Ranking: Institutional Repositories by Google Scholar SA repositories in the top 1000

Fig.4 shows that the University of Pretoria maintains a top lead in visibility of its contents indexed by Google Scholar. As shown in Fig.2 above, for example the ETDs contained at the university of Pretoria stands at 12,370, it remains to be seen how many ETDs are actually indexed by google. Coincidentally, the top repositories by ETD collections are also the same top visible repositories as indexed by Google Scholar.

Conclusion

ETDs are an imperative scholarly output in South African Universities and this content is now collected, archived and disseminated by 23 universities in the country. Universities in South Africa are group under traditional, comprehensive and universities of technology and all these have a strong commitment to research productivity and visibility. The effects of the apartheid still linger in the different level of development of these universities, however, the investment by the post-apartheid government(s) is bearing fruit (There is also a correlation between research funding and research productivity[4]). ETD by the traditional universities remain on the increase and visible. There is a strong connection between graduate student population and ETD outputs in SA universities. Newer and/or technology universities need to invest into their repositories and making their contents visible. There is a need to understand from each repository manager what the issues are in the management of ETD repositories or thesis collections. There are many questions which are unanswered which the second part of this study will address:

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[4] Based on 2017 Higher Education Data by SA Council of Higher Education

- What are the exact numbers of thesis collections in each institution in relation to other scholarly outputs?
- What is the rate of deposit of ETDs? Versus student graduation?
- How about legacy print thesis?
- How research data used to produce ETD is handled?
- What about the other outputs derived from ETD? Any cross linkages
- What are the challenges encountered in managing thesis or ETD collections?

These questions will be answered in a survey for repository managers in the second part of this study. This present study established that there is potential in exploiting this content type and also using it as a springboard for other content types such as production of research papers. The systematic management of ETDs is of key importance as South Africa embarks its journey in the 4th industrial revolution (4IR) whereby access to information beyond the paywall will be a key for success.

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