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Electronic Theses and Dissertations and Institutional Repositories: Roadmap to Research Visibility in Africa

Abstract: The study investigates the extent of Electronic Theses and Dissertations's (ETDs) adoption in university libraries in Africa as a way of making local content visible globally in open access institutional repositories (IRs). The study includes current theses submitted in electronic form and digitized theses that were in paper form (retrospective digitization). Quantitative and qualitative research methods were used. Collection of data was in two phases: website investigation and an online questionnaire. The study revealed that 56 university libraries have already adopted ETDs in their IRs; many universities in Africa have made it mandatory for their graduate students to submit their theses and dissertations in electronic form. It emerged that DSpace is the most widely adopted software used to manage ETDs in university libraries in Africa. Some of the benefits of ETDs that were identified by respondents to our questionnaire include improved university visibility and ranking, increased access to the theses and dissertations (T&Ds), saving of physical space in the library, preservation, cost savings for students, increases in readership, enhancing graduate education, introducing students to electronic publishing, and reduction of plagiarism among researchers. Issues related to the cost of equipment, lack of approved repository policy for ETDs, lack of IT skills, copyright issues, and metadata standards were identified as challenges. It is hoped that the study might provide useful insights for librarians planning to embark on a project involving digitization.

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1 Introduction

According to Chowdhury, Uddin, Afroz, and Sameni (p. 2), for "an institutional repository, there is a new method for identifying, collecting, managing, disseminating, and preserving scholarly works created in digital form by the members of an institution." At the most basic level, in an institutional repository there is a recognition that the intellectual life and scholarship of our universities will increasingly be represented, documented, and shared in digital form, and that a primary responsibility of our universities is to exercise stewardship over these riches, to make them available, and to preserve them (Lynch). Crow explained that an IR creates an enabling environment for scholarly publishing and makes the research productivity of a particular institution more visible globally. It therefore adds credibility to a university in terms of its intellectual capital.

Ezema and Ugwu lamented that the management, preservation, and dissemination of theses and dissertations in Africa fall below expectations. They added that, with the advent of information and communication technology, librarians have opportunities of preserving and disseminating theses and dissertations in electronic form through institutional repositories. Postgraduate theses and dissertations are the window to high-level research carried out in the university and high-profile publications of scholars in the making. As the student writing is closely supervised by professors, they are likely to contain information of reasonable quality. Despite the potential usefulness of theses and dissertations for research, they often languish in obscurity in university libraries and archives (Swain). They are not optimally used in universities due to their low visibility and the difficulty of accessing them (Sinha).

Some ETDs in the IRs are born-digital, i.e., submitted in digital form, while others are in print form that are "turned digital." According to Hughes, the primary advantage of digitization is to broaden and enhance accessibility of information to a wide community. A technical process, digitization is usually defined as the conversion of analog

content into digital format, in other words, a binary code, readable by computer (Manzuch, 2009).

Ezema and Ugwu point out that information generation and dissemination in Africa is generally low compared to what it is in developed countries. This does not mean that Africa, as a whole, is bereft of ideas and scholarship. According to the researchers, the major problem is that African research output lacks visibility and readership internationally, as is the case for theses and dissertations generated by African universities. The fruits of research from the formal research program of conventional universities in Africa are underused as the access to theses and dissertations is limited. Until recently, the hard-copy theses and dissertations collections in university libraries were kept in closed access, making it difficult for anyone to access them. They have remained an un-tapped asset leading to unnecessary duplication and repetition that, in effect, is the antithesis to research and a huge waste of resources, human and financial. Therefore, digitization of theses and dissertations is an answer to making local research accessible globally.

This study is aimed at investigating the extent of ETDs' adoption in universities in Africa as a way of making the local content visible globally in an open access institutional repository.

2 Research Questions

2.1 The following research questions were considered.

1. To what extent have universities in Africa adopted an ETDs programme?
2. What is the preferred software used to manage the ETDs in universities?
3. What are the benefits of the ETDs in open access institutional repositories
   - To the university
   - To the library
   - To the student?
4. What are the problems encountered at the initial stage of the digitization of -theses and dissertations?

2.2 Literature Review

2.2.1 Database of African Theses and Dissertations (DATAD)

The DATAD project is an initiative of the Association of African Universities (AAU) and sponsored by the Carnegie Corporation of NewYork City and AAU. The goals of DATAD are to allow African universities to collect, manage, and disseminate theses and dissertations (T&Ds) electronically and provide visibility through improving access to the work of African scholars in and outside the continent (Okiy).

2.3 Three-tier Repository Model

The Institutional, National and African-based Repository (INAR) is a three-tier repository model for the management of theses and dissertations emanating from universities and research institutions in Africa (Thuku). In this model the IRs are at the bottom, the National ETDs in the middle, and the regional DATAD database is at the top. Repository units established at any level have defined processes and conform to international standards, particularly for maintaining the ETDs' metadata. All units are interrelated and can share data and information across and within each level. The overall aim is to comprehensively acquire, organize, store, preserve, disseminate, and monitor use of scholarly publications of theses and dissertations emanating from Africa (Thuku).

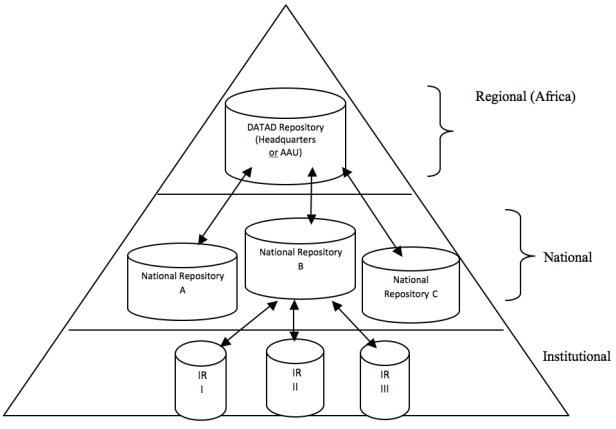

Fig. 1: Three-Tier Repository Model. (Source: Adopted from Thuku).

In this approach, Thuku reported that the institutions are custodians as they have developed their own IR policies. In this model the ETD metadata is passed on to the national repository before being dispatched to DATAD.

2.3.1 Open Access

The term "open access" refers to works that are created with no expectation of direct monetary return and made available at no cost to the reader on the Internet for education and research. It is an alternative to the traditional, subscription-based publishing model made possible by new digital technologies and networked communications (Case).

Open access facilitates the availability and distribution of scholarly communication freely, to solve the problem of inaccessibility, primarily due to financial constraints, especially in developing countries (Chowdhury, et al.). There has been a gradual realization of the usefulness of open access initiatives among universities in Africa. To this end, many universities in Africa have started developing open access IRs to make information accessible.

2.3.2 Digitization and digital preservation

Preservation has taken a new dimension with modern electronic technology. To this end, digitization of important materials that may deteriorate due to age and condition is being carried out by information professionals. A librarian identifies materials to be digitized, clears copyright issues, digitizes, provides metadata, and acquires software to make such resources available, and maintains the materials in a digital library (Fabunmi, et al.). After collections or individual items are digitized, the next stage is digital preservation, which involves all the activities undertaken to insure that digital information is maintained for as long as it is needed. It is important that sufficient research go into digital preservation in consideration of the design of an IR. In the IR context, Wheatley identified three key goals behind digital preservation:

- the data are maintained in the repository without being damaged or lost;
- the data can be retrieved and used;
- the data can be interpreted and understood.

Goals 1, 2 and 3 can be achieved in the long term.

Much needs to be done to consider digital preservation issues from the outset, and to embed digital preservation into repository workflows, which will facilitate later preservation tasks. The development of institutional repositories offers some promise in insuring the long-term preservation of digital scholarship. The study by Li and Banach to find out whether long-term preservation is part of the mission of institutional repositories in ARL revealed that ninety percent of respondents reported that their IR content is at least backed up and stored in a secure storage system. Sixty-three percent of the respondents reported that they had a checksum algorithm to detect errors in the data stored in their IR. However, other digital preservation strategies such as migration, emulation, and refreshing were reported by only half, or less, of the institutions surveyed.

2.3.3 The need for universities in Africa to adopt ETDs

As mentioned above, theses and dissertations are among the works in African university libraries that are least disseminated locally and internationally. In support of this, Ezema and Ugwu reported that the management, preservation, and dissemination of theses and dissertations in Africa fall below expectations. The researchers added that, with the advent of Information and Communication Technology (ICT), librarians now have the opportunity to preserve and disseminate theses and dissertations in electronic form. Rhodes University mounted its first digital theses on the World Wide Web in 1998, becoming the first institution in Africa to do so (Ubogu). The sharing of research results through ETDs is one of the fastest ways for scholars working in developing countries to become known and have an impact on the advance of knowledge. It is also one of the easiest and least costly ways for universities in developing countries to become involved in digital library activities and to become known for their astute deployment of technology (Fox).

The study by Baro, Oyeniran, and Ateboh revealed that theses and dissertations are among the most widely digitized library materials in Nigeria, featuring in 11 (91.7%) out of the 12 university libraries studied. The study by Ezema and Ugwu on prospects of ETDs in Nigerian university libraries revealed that the major advantage in the adoption of ETDs in Nigeria is the promotion of global visibility of Nigerian universities. Similarly, Ezema ("Managing") said that the building of institutional repositories for ETDs projects in Nigerian universities would improve the global visibility of Nigerian authors and universities. These examples illustrate how institutional repositories are now gaining ground in developing countries like Africa. It is a form of preserving our institutional output generated by members of the university community. Moxley says that a university's digital library of theses and dissertations

reflects that institution's heart and soul. Anything less than widespread adoption of mandatory ETD requirements is academic myopia. For example, SABINET (South African Bibliographic Network) provides access to a Union Catalogue of Theses and Dissertations (UCTD) that contains bibliographic records of T&Ds submitted to universities in South Africa (Anunobi, et al.).

2.4 IR management software

Studies have shown that DSpace and Eprint are among the most preferred open source softwares used by institutions in the management of ETDs worldwide (Shoeb; and Yiotis). Copeland et al. identified factors such as availability and sustainability, inter-operability, suitability, and other factors when considering software to manage ETDs.

2.4.1 Problems encountered in the adoption of ETDs in universities in Africa

The creation of an EDT program presents its own challenges, especially in light of the paucity of such programs and the concomitant lack of models for them. The key problems identified in African ETDs include lack of technological skills, and infrastructural, policy, and legal issues. Mbambo-Thata reported that in Zimbabwe, during the implementation of Database for African Theses and Dissertations (DATAD), Electronic Theses and Dissertations (ETDs) and the Institutional Repository added that the University of Zimbabwe faced a number of challenges mainly from lack of clearly documented policy on copyright and no clearly stated theses-submission policy as every department followed different channels with some theses lacking abstracts (Mbambo-Thata). Gbaje identified the challenges for the successful development of IR in Nigeria to include limited technological skills to set up and configure IR software, lack of technological infrastructures such as an Internet connection and bandwidth, lack of institutional commitment, and scholars' apathy.

Anunobi et al. studied the ETDs initiative in the Federal University of Technology, Owerri (FUTO), Nigeria, and identified challenges such as technological factors, legal issues, absence of a National plan for an ETDs consortium, personnel and user competencies, inadequate power, and ICT infrastructure. Other problems are poorly scanned copies, some submitted in applications that are unavailable in the library, and some that have their scientific and technical symbols distorted. Similarly, the study by Ezema and Ugwu identified challenges to the adoption of electronic theses and dissertations in Nigerian university libraries to include copyright issues, an irregular power supply, funding, poor ICT infrastructures, and an absence of ETD policies. Hawkins, et al., recommended that to avoid inappropriate use and copyright violations, users of the archive should be required to register for the site, providing a name, institutional affiliation, and contact information. They added that ETD policies must respect the needs of all stakeholders (faculty, students, enrollment managers, university council), not just those of the institutional repository.

3 Methodology

Quantitative and qualitative research methods were used for the study. The collection of data was in two phases: website investigation and an online questionnaire. First, a website investigation of university libraries in Africa was done to find out which university libraries have adopted ETDs in their institutional repositories. However, language barriers limited the researchers from collecting data from universities in non-English-speaking countries.

A structured questionnaire was used for data collection. To respond to the short online questionnaire, we searched university websites to identify those in charge of the ETDs, IR administrators, or digital librarians in all the 56 university libraries that have adopted ETDs. Their e-mail addresses were collected and the link to the questionnaire (https://www.surveymonkey.com/s/CYKFXJ3) was forwarded to them. Of the 56 university libraries, 22 university libraries responded to the online survey. Data collection started in August 2013 and ended January 2014. Data collected from the 22 respondents was used for analysis.

Responses from the questions relating to the challenges librarians encountered at the initial stage of the digitization of theses and dissertations were sorted according to similar viewpoints. Identifying the challenges encountered at the initial stage will inform university libraries planning digitization of theses and dissertations to consider ways to overcome challenges.

4 Results and discussions

The respondents to the online survey were asked to state their positions/designation. Out of the 22 respondents, 4

Tab. 1: Universities in Africa that have adopted ETDs in their IR.

S/N	Name of University	Country	No of ETDs	Software used	Direct link to the ETDs
1	University of Pretoria	South Africa	6,789	In-house	http://upetd.up.ac.za/
2	University of South Africa	South Africa	4,807	In-house	http://uir.unisa.ac.za/
3	University of Johannesburg	South Africa	6,351	DSpace	http://ujdigispace.uj.ac.za/
4	Rhodes University	South Africa	3,586	eprints 3	http://tinyurl.com/rudigitalcommons
5	University of Cape Town	South Africa	5,634	DigiTool	http://uctscholar.uct.ac.za/
6	University of Western Cape	South Africa	1,903	In-house	http://etd.uwc.ac.za/
7	University of Free State	South Africa	982	In-house	http://etd.uovs.ac.za/cgi-bin/ETD-browse
8	University of Fort Hare	South Africa	445	DSpace	http://ufh.netd.ac.za/
9	University of the Witwatersrand	South Africa	127, 777,2	DSpace	http://wiredspace.wits.ac.za/handle/10539/45
10	Vaal University of Technology	South Africa	54	DSpace	http://vut.netd.ac.za
11	University of Zululand	South Africa	1,213	DSpace	http://uzspace.uzulu.ac.za/
12	University of Limpopo	South Africa	839	DSpace	http://ul.netd.ac.za/jspui/
13	North-West University	South Africa	5,089	DSpace	http://dspace.nwu.ac.za/handle/10394/1
14	Stellenbosch University	South Africa	7,157	DSpace	http://scholar.sun.ac.za
15	Durban University of Technology	South Africa	648	Dspace	http://ir.dut.ac.za/
16	University of KwaZulu-Natal	South Africa	50	In-house	http://library.ukzn.ac.za/Homepage.aspx
17	University of Malawi	Malawi	278	Greenstone and DSpace	http://www.unima.mw/
18	Strathmore University	Kenya	120	In-house	http://ir.library.strathmore.edu/home.action
19	Pwani University	Kenya	35	DSpace	http://elibrary.pu.ac.ke/ir/handle/123456789/213
20	Egerton University	Kenya	116	In-house	http://www.egerton.ac.ke/index.php/Faculty-of-Agriculture/faculty-of-agriculture-thesis.html
21	Kenyatta University	Kenya	4,767	In-houes	http://ir-library.ku.ac.ke/ir
22	Chuka University	Kenya	67	In-house	http://chuka.ac.ke/index.php/research/theses
23	Jomo Kenyatta University of Agriculture and Technology (JKUAT)	Kenya	2,920	DSpace	http://www.jkuat.ac.ke/
24	Dedan Kimathi University of Technology	Kenya	3	DSpace	http://repository.dkut.ac.ke:8080/xmlui/handle/123456789/1
25	Kwame Nkrumah University of Science and Technology	Ghana	4,321	DSpace	http://dspace.knust.edu.gh:8080/jspui/handle/123456789/2
26	Christian Service University College	Ghana	234	DSpace	http://ir.csuc.edu.gh:8080/xmlui/
27	University of Education, Winneba	Ghana	3,492	DSpace	http://ir.uew.edu.gh:8080/jspui/community-list
28	Ashesi University	Ghana	98	DSpace	http://air.ashesi.edu.gh/handle/123456789/4
29	University of Cape Coast	Ghana	1,122		http://ucc.edu.gh/library/
30	Federal University of Technology, Akure	Nigeria	2,211	DSpace	http://dspace.futa.edu.ng:8080/jspui/community-list
31	Ahmadu Bello Uni. Zaria	Nigeria	13, 542	DSpace	http://kubanni.abu.edu.ng:8080/jspui

32	Covenant University	Nigeria	81	DSpace, Eprint	Dspace.covenantuniversity.edu.ng eprint.covenantuniversity.edu.ng
33	University of Jos	Nigeria	4,506	DSpace	http://dspace.unijos.edu.ng
34	University of Nigeria, Nsukka	Nigeria	21,425	DSpace	http://unn.edu.ng/chart/repo
35	Obafemi Awolowo University, Ile-Ife	Nigeria	2,500	In-house	http://www.oauife.edu.ng/oau-library/
36	Nnamdi Azikiwe University, Awka	Nigeria	1,221	In-house	http://naulibrary.org/dglibrary/admin/book_directory/Thesis/
37	University of Ibadan	Nigeria	9,326	DSpace	http://library.ui.edu.ng/index.php/2013-09-06-13-13-47/dspace-repository
38	America University of Nigeria, Yola	Nigeria	50	Greenstone	http://gsdlserver.aun.edu.ng/greenstone/cgi-bin/library.cgi
39	University of Ilorin	Nigeria	734	In-house	http://www.unilorin.edu.ng/index.php/en/postgraduate-theses
40	Bayero University, Kano	Nigeria	3,671	DSpace	http://www.buk.edu.ng/
41	Federal University of Technology, Owerri	Nigeria	2,592	In-house	http://www.futo.edu.ng/Resources/Library.aspx
42	Federal University of Technology, Minna	Nigeria	3,799	DSpace	http://dspace.futminna.edu.ng/jspui/
42	Open University of Tanzania	Tanzania	260	Eprint 3	http://repository.out.ac.tz/
43	Muhimbili University of Health and Allied Science	Tanzania	1,005	DSpace	http://ir/muhas.ac.tz:8080/jspui/
44	Sainth Augustine University of Tanzania	Tanzania	12	DSpace	http://41.59.3.91:8080/xmlui/
45	Sokoine University of Agriculture	Tanzania	2,451	DSpace	http://www.taccire.suanet.ac.tz/xmlui
46	University of Namibia	Namibia	237	DSpace	http://digital.unam.na
47	Makerere University	Uganda	75	DSpace	http://dspace3.mak.ac.ug/xmlui/
48	University of Khartoum	Sudan	17	DSpace	http://khartoumspace.uofk.edu: 8080/jspui/
49	Bindura University of Science Education	Zimbabwe	15	DSpace	http://digilib.buse.ac.zw:8090/xmlui/
50	University of Zimbabwe	Zimbabwe	711	DSpace	http://ir.uz.ac.zw/jspui/handle/10646/585
51	National University of Science and Technology	Zimbabwe	168	DSpace	http://ir.nust.ac.zw:8080/jspui/
52	University of Zambia	Zambia	2,925	DSpace	http://dspace.unza.zm:8080/xmlui
53	Addis Ababa University	Ethiopia	4,411	DSpace	http://etd.aau.edu.et/dspace
54	National University of Lesotho	Lesotho	21	Greenstone	http://repository.tml.nul.ls
55	University of Botswana	Botswana	1	DSpace	http://ubrisa.ub.bw/handle/10311/909
56	American University in Cairo	Egypt	1,195	DSpace	http://dar.aucegypt.edu/handle/10526/1925

indicated they were IR administrator/managers, 5 were Digital librarians, 10 were Systems librarians, and 3 were Digital content creators.

4.4.1 Universities in Africa with ETD Programs.

The website investigation of the adoption of ETD projects in university libraries in Africa revealed that a good number of university libraries have already adopted ETDs in their IRs (see Table 2). More and more universities in Africa are beginning to embrace the idea of creating and maintaining a repository of ETDs either through submission of born-digital files by graduates or through digitization of print copies of theses and dissertations submitted to the university library.

4.4.2 Submission of T&D in electronic form

The website investigation shows that many universities in Africa have made it mandatory for their graduate students to submit their theses and dissertations in electronic form. Some of them are Rhodes University, South Africa; University of Pretoria, South Africa; Covenant University, Nigeria; and Federal University of Technology, Owerri, Nigeria. According to Anunobi et al. at FUTO, the researcher will submit his/her Ph.D. thesis in an

appropriate electronic format, along with a hard copy. The electronic copy of the doctoral thesis will be stored in the university's ETD repository. Sooner or later, the submission of multiple hard copies will gradually disappear in favor of digital ones.

4.4.3 Software used by the institutions to manage their ETDs

The study revealed that DSpace software was widely used by a majority of the institutions that have adopted ETDs. This finding agrees with the findings of Shoeb and Yiotis. The study by Yiotis revealed that DSpace is used all over the world, in places such as the Philippines, Russia, India, Canada, Japan, 15 African nations, the U.S., and the U.K. Only three universities used Eprint (Rhodes University, South Africa, Open University of Tanzania, Covenant University, Nigeria) and three universities used Greenstone software (National University of Lesotho and University of Malawi, and American University of Nigeria). Some other universities use in-house software developed to manage their ETDs such as duraspace (see Table 1).

4.4.4 Membership of regional and international ETD repositories

Further investigation of the IRs revealed that many African universities now belong to or are contributors to regional and international repositories such as OpenDOAR and DATAD (http://www.aau.org/membership/fullmembers.php and www.opendoar.org/countrylist.php?cCon). But only universities in South Africa were listed as contributors to The Networked Digital Library of Theses and Dissertations (NDLTD); http://www.ndltd.org/about/membership; (see Table 2). The NDLTD is a global organization committed to the acceleration of the institutional adoption of ETD programs, with participation from institutions on six continents (NDLTD).

Tab. 2: African universities that contribute to regional and international ETD repositories such as DATAD, OpenDOAR, and NDLTD.

Name of Institution	NDLTD	DATAD	OpenDOAR
University of Pretoria, South Africa	✓	✓	✓
University of South Africa	✓	✓	✓
University of Johannesburg, South Africa	✓	✓	✓
Rhodes University, South Africa	✓	✓	✓
University of Cape Town, South Africa	–	✓	✓
University of Western Cape, South Africa	✓	✓	✓
University of Free State, South Africa	✓	✓	✓
University of Fort Hare, South Africa	–	✓	✓
University of the Witwatersrand, South Africa	–	✓	✓
Vaal University of Technology, South Africa	–	–	✓
University of Zululand, South Africa	✓	–	✓
University of Limpopo, South Africa	–	–	✓
North-West University, South Africa	–	✓	✓
Stellenbosch University, South Africa	–	–	✓
Cape Peninsula University of Technology, South Africa	–	✓	✓
Durban University of Technology, South Africa	✓	✓	✓
University of KwaZulu-Natal, South Africa	✓	✓	✓
National University of Science and Technology, Zimbabwe	–	–	✓
University of Zimbabwe	✓	✓	✓
Bindura University of Science Education, Zimbabwe	–	✓	✓
National University of Science and Technology, Lesotho	–	✓	✓
University of Bostwana	–	✓	✓
Addis Ababa University, Ethiopia	–	✓	✓

University of Namibia	–	✓	✓
Makerere University, Ugandia	–	–	✓
University of Zambia	–	✓	✓
American University in Cairo, Egypt	–	–	✓
University of Khartoum, Sudan	–	✓	✓
Kwame Nkrumah University of Science and Technology, Ghana	–	✓	✓
University of Cape Coast, Ghana	–	✓	✓
Christian Service University College, Ghana	–	–	–
University of Education, Winneba, Ghan	–	✓	✓
Ashesi University College, Ghana	–	✓	✓
University of Malawi	–	✓	✓
Strathmore University, Kenya	–	✓	✓
Pwani University, Kenya	–	–	✓
Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya	–	✓	✓
Kenyatta University, Kenya	–	✓	✓
Dedan Kimathi University of Technology, Kenya	–	–	–
Chuka University, Kenya	–	–	✓
Egerton University, Kenya	–	–	✓
The Open University of Tanzania	–	✓	✓
Muhimbili University of Health and Allied Science (MUHAS), Tanzania	–	–	✓
Sainth Augustine University of Tanzania	–	✓	✓
Sokoine University of Agriculture, Tanzania	–	✓	✓
University of Ilorin, Nigeria	–	✓	✓
Bayero University, Kano, Nigeria	–	✓	✓
Federal University of Technology, Owerri, Nigeria	–	✓	✓
Ahmadu Bello Uni. Zaria, Nigeria	–	✓	✓
Covenant University, Nigeria	–	✓	✓
University of Ibadan, Nigeria	–	✓	✓
Federal University of Technology, Akure, Nigeria	–	✓	✓
Obafemi Awolowo University, Ile-Ife, Nigeria	–	✓	✓
Nnamdi Azikiwe University, Awka, Nigeria	–	✓	✓
University of Jos, Nigeria	–	✓	✓
University of Nigeria, Nsukka, Nigeria	–	✓	✓
America University of Nigeria, Yola, Nigeria	–	–	–

Tab. 3: Webometrics Ranking of IRs in Africa

Name of university	Country	World IRs Ranking	Africa IRs Ranking
University of Pretoria	South Africa	62	1
Stellenbosch University	South Africa	113	2
University of South Africa	South Africa	118	3
University of the Witwaterand	South Africa	124	4
University of Pretoria	South Africa	176	5
Council for Scientific and Industrial Research	South Africa	195	6

University of Johannesburg	South Africa	200	7
Rhodes University	South Africa	264	8
Addis Ababa University	Ethiopia	344	9
Boloka North West University	South Africa	399	10
University of Nairobi	Kenya	419	11
American University in Cairo	Egypt	461	12
Covenant University	Nigeria	475	13
University of Free State	South Africa	539	14
Durban University of Technology	South Africa	603	15
University of Limpopo	South Africa	660	16
Kenyatta University	Kenya	663	17
University of the Western Cape	South Africa	668	18
Makerere University	Uganda	671	19
University of Fort Hare	South Africa	749	20
E-doc Universite Virtuelle de Tunis	Tunisia	787	21
University of Jos	Nigeria	792	22
Saber Producao Cientifica Mocambicana de Acesso Livre	Mozambeque	805	23
University of Zululand	South Africa	826	24
University of Zimbabwe	Zimbabwe	838	25
University of Cape Town	South Africa	945	26
University of Western Cape	South Africa	961	27
University of Ghana	Ghana	1052	28
Cape Peninsula University	South Africa	1057	29
University of Botswana	Bostwana	1074	30
Ounongo Repository Polytechnic of Namibia	Namibia	1079	31
Kwame Nkrumah University of Science & Technology	Ghana	1106	32
University of KwaZulu-Natal	South Africa	1119	33
AHERO African Higher Education Research	South Africa	1144	34
Biblioteca Digital da Universidade Jean Piaget de Cabo Verde	Cape Verde	1280	35
Strathmore University	South Africa	1312	36
Muhimbili University of Health and Allied Sciencies	Tanzania	1322	37
TWAS & OWSDW Theses	South Africa	1457	38
Federal University of Technology, Minna	Nigeria	1501	39
University of Namibia	Namibia	1510	40
Uganda Martyrs University	Uganda	1511	41
National University of Rwanda	Rwanda	1595	42
University of Cape Town	South Africa	1627	43

The December 2013 Webometrics Ranking of World Repositories in terms of size, visibility, and content showed many African universities ranked among the first 2000 best IRs worldwide (http://repositories.webometrics.info/en/world?) (see Table 3). Ranking of the best 43 IRs in Africa is also shown (http://repositories.webometrics.info/en/Ranking_africa). It is therefore evident that research output of African scholars is gradually being made accessible globally through the various open access IRs. This will boost the reputation of African universities on the world's stage. According to Moxley, while in the past a university's quality was linked to its library, in the future it will also be linked to its digital library of theses and dissertations, which are easily available over the

Internet. If universities in Africa are to plan for effective organization and management of IRs, collective efforts and collaboration by institutions in Africa in areas of ETDs will definitely bring excellent results. By so doing, African universities will be able to organize and disseminate research to people who cannot access it in person. In Africa, for several years, universities have generated valuable knowledge through research and development in the form of theses and dissertations. Sharing of ETDs is one of the easiest and least costly ways for universities in developing countries to become involved in digital library activities.

4.1 Benefits of ETDs to the university, library, and student

4.1.1 The university

Regarding benefits of ETDs to the university, a majority (20: 90.9%) of the respondents mentioned "improve university ranking worldwide," and "improve university visibility." ETDs showcase the intellectual achievements of a university by making them available worldwide. This finding supports the findings of Ezema and Ugwu that the major advantage of the adoption of ETDs in Nigeria is the promotion of global visibility of Nigerian universities, followed by enhanced scholarly communication, enhanced research dissemination in and outside Nigeria, and opportunity for the preservation of theses and dissertations in the country. According to Ubogu, an ETD program would promote collaboration among research programs at separate universities/technikons (technikons are Colleges of Advanced Technical Education providing vocational education on a tertiary level. They confer technical degrees on three levels: Bachelor, Master's and Doctoral) by making research visible and accessible via a networked archive.

Fox also identified the benefits of ETDs to the university as a way for the research carried out in connection with their graduate programs to become visible to large numbers of interested parties around the world. High-quality ETDs may add not only to the reputation of the students preparing them, but also to the faculty, research groups, laboratories, centers, departments, colleges, and universities involved; if a campus switches from paper to electronic submission, there are savings in library shelf space, binding, shelving, and reductions in the cost associated with checking and cataloging; an ETD program leads to improvements in universities regarding digital library infrastructure; and ETD programs may raise the understanding on a campus of key concepts.

4.1.2 The library

Analysis regarding the benefits of ETDs to the library shows that 19 (86.4%) of the 22 respondents indicated that adoption of ETDs would increase access to the theses and dissertations, 13 (59.1%) of the 22 respondents indicated that ETDs save space in the library, and all the 22 (100%) respondents indicated preservation of the work for future generations. Therefore, the study revealed that benefits of ETDs related to the library include: increased access to the texts, saved space in the library, and preservation of the work for future generations. These findings agree with those of Swain, Moxley, and Rama. ETDs provide a solution to address their physical space requirements. With ETDs, no physical shelf space is needed, and libraries do not have to worry about circulation, shelving, labeling, bar-coding, and cataloging of theses and dissertations (Rama), even though metadata will still need to be created.

4.1.3 The student

Eighteen (81.8%) of the 22 respondents indicated that ETDs save costs for students (no printing or binding costs). This finding supports the findings of Fox that ETDs have zero cost, which compares favorably with the charges of hundreds or thousands of dollars otherwise required to print, copy, or publish texts using paper or other media. In the "others please specify" option, respondents mentioned that ETDs increase readership, enhance graduate education, introduce students to electronic publishing, and reduce plagiarism among researchers. Fox stated that with a globally accessible collection of ETDs, students can quickly search for works related to their interest area from anywhere in the world, and in most cases access them without incurring any cost. It is likely that they will be frequently consulted by millions of researchers and graduate students interested in detailed studies, expositions of new methodologies, reviews of the literature on specialized topics, extensive bibliographies, and illustrative figures and tables. For example, one electronic dissertation at Virginia Tech was accessed over 9,000 times in one year (University of Cincinnati). Thus, students and students' works will become more visible, facilitating advances in scholarship and potentially leading to increasing collaboration, each made possible by electronic communication across space and time (Fox, et al.).

4.2 Challenges librarians encountered at the initial stage of the ETDs project

A total of 21 (95.5%) of the respondents mentioned issues related to cost of equipment as a challenge at the initial stage of the ETD project. Similarly, 21 (95.5%) of the respondents mentioned that budgeting for retrospective digitization was a challenge at the initial stage of the ETDs project. This result generally consolidates findings by Mapulanga; Ezema and Ugwu; and Fabunmi, et al. that lack of funding is a deterrent to digitization projects in Africa. Digitization of theses and dissertations needs a lot of finance for procurement of facilities and training of staff. Digital preservation is a significant problem facing libraries most especially in developing countries like those in Africa. Libraries in Africa are struggling with how to preserve the scholarly content now that this information is increasingly being produced in digital form. Institutions that have successfully adopted IR should develop, approve, and implement digital preservation policies. Digital information is fragile and faces many threats including technological obsolescence and the deterioration of digital storage media (Li and Banach). IRs need to consider digital preservation as long-term measures to insure the preservation of contents of their IRs.

Further analysis of the data revealed that 15 (68.2%) of the 22 respondents mentioned issues related to ETDs policy/repository policy yet to be passed by management as a challenges at the initial stage of the ETDs project. This finding supports earlier findings by Swain that in India, national policies in institutional repositories are lacking. He added that few institutions require electronic submission and deposit, and there are few established ETDs repositories and few in the planning stage. Hawkins et al. called for institutions to make their ETD policies and information about ETDs available prominently and conveniently on their websites and in their practices.

Lack of IT skills was mentioned by 20 (90.9%) of the 22 respondents as a challenge at the initial stage of the ETDs project. This finding agrees with studies that have identified lack of skills in full-text digitization and teaching skills, IT infrastructure, management and availability of African-generated content for the digital collections, and IR development in African university libraries (Rosenberg, Baro, et al.; Baro; Baro and Asaba; Chiware). Finally, 17 (77.3%) of the 22 respondents mentioned metadata standards, and 8 (36.4%) of the 22 respondents mentioned that withdrawal of theses from circulation was a challenge at the initial stage of the ETDs project. With the pace of developments in electronic theses and dissertations in Africa, it is important that management in African university libraries come up with solutions to training. The training of staff can take the form of continuing educational programs (workshops/seminars, short courses), or through formal training in Library and Information Science schools.

5 Conclusion

The study revealed that a good number of university libraries have already adopted ETDs in their IRs; many universities in Africa have made it mandatory for their graduate students to submit their theses and dissertations in electronic form. It was observed that the most widely adopted software to manage ETDs in university libraries in Africa is DSpace. Many African universities now belong to or are contributors to regional and international repositories such as OpenDOAR, DATAD, and NDLTD. No doubt, the adoption of ETDs in open access repositories and belonging to regional and international repositories will enhance the webometrics ranking worldwide of universities in Africa. Benefits related to the adoption of ETDs include improved university ranking worldwide, improved university visibility, increased access to the texts, saving of physical space in the library, and preservation of the work for future generations. Others are savings of cost for students, increased readership, enhanced graduate education, introduction of students to electronic publishing, and reduction of plagiarism among researchers. The study identified challenges such as lack of funds, absence of ETDs policy, lack of skills, copyright issues, and lack of metadata standards.

Theses and dissertations freely available on the Internet are globally accessible; they raise the profiles of the students who author them, the faculty and departments who foster them, and the institutions that provide them to the world. It is anticipated that the visibility and availability of ETDs will result in their dissemination nationally and internationally, with obvious benefits for Africa. Increasingly the availability of and access to digital resources such as ETDs for students, faculty, and researchers continues to be a high priority for academic libraries as they redefine their roles as digital knowledge centers. The emphasis is now overwhelmingly digital, as libraries struggle to meet an ever-increasing demand for digital and online content.

6 Recommendations

The following recommendations are based on this study's findings.

- Funds need to be provided for digitization projects by government, non-governmental organizations, and universities.
- Universities in Africa should formulate policies on mandatory submission of ETDs.
- It is necessary to establish co-operation across universities in Africa on ETDs management.
- Digitization skills should be added to the library and information science school curricula in African universities.
- For digitization of theses and dissertations to be successful, university library staff need to work in collaboration with ICT department staff.
- Training and re-training of librarians is needed to cope with the challenges related to digitization activities.
- Copyright issues and other legal requirements should be planned at the initial stage of the digitization projects.
- There should be further research focusing on digital preservation strategies for IRs in Africa.

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Electronic Theses and Dissertations and Institutional Repositories in Universities in Africa Questionnaire

1. Name of Institution and Country ----------

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2. Staff position/designation ----------
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3. What software does your library use in managing the ETDs?

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4. What are the benefits of ETDs in the open access institutional repository to the university, library and student?

a) Improve university ranking worldwide [ ].
b) Improve university visibility [ ].
c) Increase access to the T&Ds [ ].
d) Saves space in the library [ ].
e) Preservation of the work for future generation [ ].
f) Saves cost for students [ ].

Others, please specify ----------

What are some of the challenges your library encountered at the initial stage of the digitization of theses and dissertations or the ETDS projects?

