Performance assessment of electronic theses and dissertations initiatives in Nigeria

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Abstract

Purpose – The purpose of this study is to investigate the performance of electronic theses and dissertations (ETD) initiatives in the repositories of federal government-owned universities due to the poor global visibility of ETDs from Nigeria.

Design/methodology/approach – An explanatory case study empirical research method was adopted for the study. Using an adapted methodology of Ghosh (2009) and multiple data gathering techniques, data was collected based on the three domains of the network of excellence on digital libraries (DELOS) digital library reference model.

Findings – The ETD initiatives in repositories of Nigerian federal universities have not made remarkable progress as digital libraries based on policy, content and system architecture. The specificity of ETDs is not clearly stated in the policies where available. The repositories housing the ETDs are also not compliant with the open archive initiative-protocol for metadata harvesting framework.

Research limitations/implications – The study focussed on ETD initiatives in federal government-owned universities. Although the findings of the study are relevant to other institutions in Nigeria and sub-Saharan Africa. It cannot be used as a basis for the generalisation based on other performance metrics.

Practical implications – This research study concluded that electronic theses and dissertations in Nigerian institutional repositories are not well managed for effective service delivery and long-term accessibility. The ill-management of the ETD initiatives is the reason for the poor global visibility and accessibility of these research output from this part of Africa.

Originality/value – The study assessed ETD initiatives using constructs from a theoretical framework.

Keywords ETDs, University libraries, Repositories, Electronic theses and dissertations, Performance assessment, DELOS digital library model

Paper type Case study

Introduction

Theses and dissertations are useful sources of research information for prospective graduate students, researchers, policymakers and other practitioners (Alan and Pandey, 2012). These valuable research outputs are churned out of the Nigerian universities every year by post-degree candidates. Not only do these "intellectual core" of universities represent the significant research and scholarship of the universities they represent but they are also a valuable historical record of the research and teaching community (Middleton *et al.*, 2015). Theses contain crucial research findings which can be used and implemented in industries

and vital sectors of the economy in Nigeria. Thus, there is a need for long-term accessibility and preservation of these vital information resources for posterity (Ifijeh, 2014). On the contrary, however, Han (2014) noted that theses and dissertations are not usually available through the usual routine of scholarly publication and distribution. This author further stated that within the traditional libraries workflow, these resources are either partially catalogued or not catalogued at all, thus making them difficult to access. Alan and Pandey (2012) also stressed that the non-publishing status of theses and dissertations have over time made most of them languish in obscurity as grey literature in university libraries and archives, and thus accessibility was a difficult task. These points have made retrieval of information about theses in Nigeria difficult.

The reason for this is not far-fetched, hitherto to the internet era, theses and dissertations were printed with limited copies archived and available in the university libraries. However, with the advent of information and communication technology and the internet technology, printed copies of theses now come in an electronic format whose printed copies have either been digitised or are produced as soft copies. These copies are now stored in repositories of university libraries. The Digital Access to Research Thesis-Europe (DART-Europe) defined electronic theses and dissertations as the electronic format of produced printed theses. The electronic format of theses and dissertations has made multiple access to the contents easier. This is because millions of users can have access to just one electronic copy of a thesis which was quite difficult with the printed copies. Also, the long term preservation of theses and dissertations have been made easier with electronic theses and dissertations (ETDs) which is a welcome development especially for libraries in Nigeria that over the years have been grappling with the preservation of print theses and dissertations. Ironically, emphasis has continuously been laid on the dearth of research information for postgraduate researchers in Nigeria. Venitha (2015) reported a disturbingly low postgraduate research output from Africa with African Universities producing less than 1% of global scholarly output. The Database of African Theses and Dissertations (DATAD) initiative also indicated that African research results are rarely indexed in major international databases; a situation which they stated is further exacerbated by the inaccessibility of theses and dissertations completed in the region, that contain local empirical data not available in international literature. The researchers of this study observed that postgraduate students in the universities requested and consulted theses from foreign universities. This development according to Ezema (2011) makes African researchers depend highly on the information generated from the developed countries of Europe and the USA, which to a large extent may not follow the format and context of African problems. An assessment of ETD initiatives in Nigeria is necessary to assess the strengths and weaknesses of these initiatives that started a decade ago. A peruse of the literature on ETD initiatives showed that there are various assessment parameters based on individual perceptions. To make an assessment based on best practice, a theory-based assessment study was used, primarily because of the dearth of theory-based studies in the literature (Cayabyab, 2015). This study explored the management of ETD initiatives of federal university libraries in Nigeria based on three concepts of the DELOS digital library reference model-policies, contents and system architecture.

The network of excellence on digital libraries digital library reference model
Several models and theories of digital libraries have been developed to guide digital library designers towards building better digital libraries that will meet the information needs of various users. (Isah et al., 2013). DELOS reference model and 5S theory are two prominent

digital libraries, evaluation models. The concepts and domains of DELOS model (content, user, functionality, quality, policy and architecture) focus more on the development and implementation stage of digital libraries, while the concepts of the 5S model (streams, structures, spaces, scenarios and societies) resonates with well developed and implemented digital libraries. The DELOS model addresses issues generated from the development of digital libraries. It comprises of a three-tier framework consisting of digital library, digital library system and digital library management system. Six core domains defined in the model provides the base for digital libraries; these have been defined by all systems as core functionalities. They include content, user, functionality, quality, policy and architecture. Isah et al. (2013) see the DELOS digital library reference model as a conceptual framework designed for the development of appropriate digital library systems. In their opinion, the model also addresses the entities and their relationship in the digital library universe.

The six domains defined by this model include:

- *Contents:* This includes all the information objects a digital library contains. These includes not just objects but also data and metadata.
- *Users:* This concept covers the various players that interact with the digital library. They could be human or machine entitled to communicate with the digital library (Candela et al., 2007).
- *Functionality:* Includes the services a digital library offers to its users, these include but not limited to information object registration, search and browse to mention but a few.
- *Quality:* Encompasses the parameters that can be used to assess the content and behaviour of the digital library system. Candela et al. (2007) opined that some of these parameters could be objective in nature and can be automatically measured or subjective in nature and can be measured only by user evaluation. The subjective parameters can be measured using use of technology models such as the diffusion of innovation model or the unified theory of acceptance and use model.
- *Policy:* Includes rules and regulations governing the use of the digital library and its users. Candela et al. (2007) listed acceptable user behaviour, digital rights management, privacy and confidentiality, charges to users and collection delivery as examples of policies which could guide digital libraries. However, not all these policies can be defined within the digital libraries or the organisations managing them.
- *Architecture:* Refers to the system entity and this includes the hard/software components of a digital library. Candela et al. (2007) see architecture as a core concept for two reasons; the complex forms of digital libraries and the essential nature of interoperability across digital libraries.

The DELOS reference model is a three-tiered framework. The three tiers are digital library management system, digital library system and digital library.

The DELOS digital model is appropriate for this study because one of the tiers of the framework can align with management of contents in the digital library. Candela et al. (2011) corroborated that the DELOS framework can be used for coordinating approaches, solutions and systems development in the digital library area. However, despite its attempt at shaping and unifying the development of digital libraries, the application of all the concepts of the model in assessment studies especially with digital libraries in developing countries, is difficult. Isah et al. (2013) noticed this limitation in the dearth of research studies on the application of all the concepts of the model. The nature of institutional repositories which

are the digital libraries/storehouses of ETDS in developing countries such as Nigeria are still relatively in the development and implementation stages and thus the appropriate model for this study. The assessment of ETD initiatives using this model would guide ETD repository managers towards better-managed repositories.

This study is based on one tier of the framework, which is the digital library management system. Although it provides for the six domains, this study adapted three domains, namely, contents, policy and architecture. This study exempted the other three domains because the foci of the other domains were on well-established ETD initiatives repositories and may not generate comprehensive data. For instance, the functionality domain is about the services a digital library software offers to its users. All of the repositories investigated used DSpace open-access software and thus had uniform information object registration, search and browse services. Including this domain would mean the study investigating the functionality of DSpace software for preserving the ETDs, which is not the focus of this study.

On the other hand, several studies (Hinmikaiye, 2015; Mohammed *et al.*, 2019; Valde, 2016) have investigated the quality domain of repositories. The quality domain focuses on the resources and services provided by repositories. Findings from theses research studies revealed poor quality services. The challenges attributed to the poor quality services of repositories is one of the reasons for investigating the repositories which this research study conducted.

For the context of this research study, the domains were conceptualised thus:

- Policy-policy statements or implementation of ETD initiatives in Nigerian repositories that were specifically guiding the acquisition, organisation and dissemination of ETD contents.
- Contents-management of the ETD contents, including copyright issues and accessibility.
- *System architecture:* Storage servers and interoperability with other digital library software globally.

Related studies

Policies

Policy formulation and implementation are pertinent to the success of the management of contents in any digital library. Cayabyab (2015) opined that the imposition of policies played an important role in the implementation of any project, especially ETD projects. A lot of exploratory studies about the adoption, development and implementation of ETD repositories are available in the literature (Sengupta, 2014; Baro *et al.*, 2014). A gap identified in these studies was the assessment of policies establishing these initiatives. This was also evident in several studies, such as Corletey (2011), Baro *et al.* (2014) and Baro and Otiode (2014) that reported an absence of policies legalising the repositories or ETD initiatives in selected universities in Africa. From the literature reviewed on ETD initiatives across the world, one can posit that one of the reasons for the success and failure of ETD initiatives in some countries and institutions is primarily due to the compulsory submission policy. The success of the Networked Digital Library of Theses and Dissertations (NDLTD) ETD project was associated with the implementation of the policy on submission. The Vidyanidhi project in India, which was supposed to be a national repository and consortium for e-theses failed, according to Sheeja (2011) because there was no provision made for mandatory submission. Corroborating the opinion of these authors, Riddle (2015) stated that many

repository initiatives including ETDs operate under policies that do not account for its widespread and sophisticated use. From the literature reviewed, the researchers found limited literature on assessment of policies establishing e-theses initiatives in in sub-sahara African countries, including Nigeria. Findings of the success or otherwise of these initiatives, especially with regards to the contents and implementation of policies would contribute to the management of ETD initiatives in developing countries.

Contents

Majority of the ETD initiatives, mainly from sub-Saharan Africa and Asian countries have undefined content management policies. It was observed that while research studies on ETD initiatives in the developed world in recent times focused on the assessment of the contents of ETD initiatives primarily as it affects digital preservation (Termens et al., 2015). The focus for Nigeria is still on content population and recruitment, especially copyright which is one of the first challenges of ETD development according to Cayabyab (2015). In fact, it is one of the reasons for the low content population of ETD initiatives especially the belief that contents can be copied verbatim and submitted to another university as new research. What the defenders of "closed access" to ETD contents do not realise is the counter-productiveness of closed access. Plagiarism can easily be carried out online but it is also easy to detect online. Another significant gap noted from Nigeria is the issue of copyright ownership of ETDs. If the ETD repositories thrive successfully, copyright will become an issue with time.

Digital preservation of the contents in ETD repositories is another contending issue. Although countries such as Nigeria have a long way to go to meet up, especially with the belief that having ETDs in repositories takes care of long-term digital preservation (Gbaje and Mohammed, 2017). It would be an advantage to countries that are just starting or are at the early stages of their ETD initiatives to pick one or two best practices, especially how mismanagement of contents can affect the long-term preservation. These factors if not properly handled, may lead to under utilisation of the contents which, according to Cayabyab (2015) is failure evidence of an ETD project. A recent study by Massicotte and Botter (2017) discovered 23% accessibility linkrot with 664 doctoral dissertations. Metadata elements in Canadian institutional repositories, according to Park and Richard (2011) had a significant level of inconsistency and variation. Authors such as Massicotte and Botter (2017) and Park and Richard (2011) recommended broader awareness and the development of standardised content application profiles. The literature on assessment of contents of ETD initiatives in developing countries are minimal and this research study filled this gap.

System architecture

Storage infrastructure and interoperability of ETD initiatives are challenges in the management of ETD initiatives. Most start-up ETD initiatives usually deploy storage management infrastructure within the organisation, which according to Waddington et al. (2013) requires typically long lead times and upfront capital investment. A review on the comparison of open and propriety software for repositories by the authors revealed common factors why libraries opt for proprietary repository software to include the cost of purchasing and maintaining technical infrastructure and staffing and also the need to allow room for advocacy and populating the repository. On the other hand, flexibility and extensibility advantage in the customisation process and also interoperability skews libraries towards open access.

Another pertinent issue worthy of note is the system interoperability. Servers' configuration, software specification and customisation, metadata schemas and all that aids

the interoperability of repositories with other information systems, especially search engines, which increases the visibility of the repositories. This is because of the vital role that search engines play in information seeking and retrieval which has resulted in the increased importance of maintaining strong visibility on search engine result pages by Web organisations (Onaifo and Rasmussen, 2013). Thus, repositories developed for postgraduate students theses must be highly interoperable with search engines because this crop of researchers does not have the time to search individual repositories. The first port of call is usually a search engine that can return results from these individual repositories. Several unique characteristics of ETDs which should be considered when evaluating interoperability methods include language, scale, format, bibliography, metadata and user – variety in range and scope of user interests (Goncalves *et al.*, 2000). In the comparative study of three interoperability protocols by Hakimjavadi and Masrek (2013), protocol for metadata harvesting (PMH) was still the most used interoperability protocol within ETD providers despite its drawbacks, followed by ATOM and object reuse and exchangeprotocols.

Methodology

An explanatory case study research method was adopted for the study. Using an adapted methodology of Ghosh (2009) and multiple data gathering techniques, data was collected based on the three domains of the network of excellence on digital libraries (DELOS) digital library reference model used for this study. Multiple data gathering technique was used in other to validate the data. The respondents were the IR administrators of 10 federal government-owned universities in Nigeria.

To select the population, the ETD repositories of federal university libraries were identified using three sources:

(1) Directory of Open Access Repositories DOAR (http://v2.sherpa.ac.uk/view/repository_by_country/ng.html).

(2) Nigerian Research Education Network NgREN (http://repository.ngren.edu.ng:8080/).

(3) Internet search for the online presence of repositories of the universities listed/not listed on both Open DOAR and NgREN using Google.

Open DOAR and NgREN websites lists and provides information on academic open access repositories, including ETD initiatives in Africa and Nigeria, respectively. Open DOAR's overview was not comprehensive because the inclusion on their directory is not compulsory. Some ETD initiatives were also listed on NgREN but were not available on the Open DOAR website. However, in other to take care of inconsistencies, the internet search for the online presence of the ETD initiatives was used to validate the list from Open DOAR and NgREN.

Nigerian Federal University libraries had a total of 15 functional repositories. For this study; however, 10 of the repositories were purposively selected based on two criteria:

(1) Online presence for three months (the researchers visited the repository websites twice a week for three months from November 2017 to January 2018).

(2) The repositories must have theses and dissertations listed as a community, sub-community or are embedded in the contents of the faculties.

The data were collected using a questionnaire and observation checklist based on the questionnaire. An online questionnaire was sent to the email addresses of the 10 repository administrators. A follow-up reminder was sent after two weeks to the repository administrators that had not responded to the first email. After the distribution of the

questionnaires, the consent of the ETD administrators was sought for a structured interview to explain further some of their responses based on the questions answered. The researchers also visited the websites of the repositories to validate the responses from the questionnaire. (Appendix 2 and 3 for observation checklist and interview schedule).

Results and discussion of findings
Assessment of policies, contents and system architecture of electronic theses and dissertations initiatives
ETD repository administrators were requested to indicate if there was a repository statement/policy backing the establishment/management of their repositories and the contents of such policies where available.

Policy
The results in Table 1 showed that six of the university libraries had policy documents for their institutional repositories, while four did not have policies. The researchers however noted that the libraries that had policies had elements of ETDs as contents embedded in the policies. It is worthy to note that the mechanism for policy implementation for ETDs was not defined in the policies and this reflected in the management or operation of these library repositories.

This situation implied that there was no specific policy for the management of ETDs in Nigerian library repositories, although most libraries and postgraduate schools have policies for their print theses. The *modus operandi* for the management of print theses are different from ETD or other contents in institutional repositories; thus, these policies are not applicable. It was also noted that ETDs are seen with the same lens as journal and conference articles which should not be the case. ETDs are not third party research outputs from external publishers; they are published and partly owned by the universities. Thus, separate policy implementation should reflect how they should be managed and organised. Imposition and implementation of policy play an essential role in the success of a project (Cayabyab, 2015). In line with the findings in this research, Ashikuzzaman (2018) mentioned that the absence of a clear institutional policy was a constraint for IR development because of the uncertainty that would exist about the norms to be adopted in specific cases. In the case of this study, the absence of a clear ETD policy reflected in the content population and access, copyright and even preservation measures.

However, the IR policy issue seems to be an African challenge compared to developed countries. Corletey (2011) reported the absence of policies legalising the repositories in four

S/N	Universities	Yes	No	Working on it
1	Ahmadu Bello University (ABU)	✓		
2	Federal University Oye-Ekiti (FOYE)		✓	
3	Federal University of Technology, Minna (FUTM)			✓
4	Federal University of Technology, Owerri (FUTO)			✓
5	University of Ibadan (UI)			✓
6	University of Ilorin (UNIL)	✓		
7	University of Jos (UJ)	✓		
8	University of Lagos (UNILAG)	✓		
9	Usman Danfodio University, Sokoto (UDUS)	✓		
10	University of Nigeria Nsukka (UNN)	✓		

Table 1.
Policy

universities in Ghana. Similarly, Baro and Otiode (2014) also reported a lack of approved repositories policies for electronic theses and dissertations in some selected African countries. The developed countries, on the other hand, have well-stated policies and implementation strategies, for example, challenges related to publishers' rejection of articles based on ETDs in IRs. McCutcheon (2010) study reported that several policies within the USA had implementation strategies such as publication delays and flexibility in changing distribution options, which aided students in avoiding publishers' rejection.

Results from Table 2 revealed that preservation and submission policies were quite high; the researchers, however, observed from the repositories that the theses and dissertations of some of these repositories were quite low, while some repositories had not uploaded theses and dissertations after the initial take-off. The situation with ETD initiatives in Nigeria based on the results in Table 2 implied that although postgraduate students submitted electronic copies of their final theses to the libraries, they do not upload the same to the repository (more findings are stated on the section of findings from interview).

The findings of Salau et al. (2018) corroborated this; the researchers found out that randomly trained library staff were in charge of uploading ETDs to the repositories. Including this task to the workflow of library staff that is already burdened with other activities is counterproductive and a pointer to this is the low number of ETDs in the repositories. One of the reliable indicators of the success of any repository according to Kounoudes and Zervas (2011) is the number of submissions which includes a high number of submissions and the frequency of submissions. Going by the assertion of Kounoudes and Zervas (2011), the ETD initiatives in Nigeria are not successful.

The researcher also observed from the responses that the preservation mechanism for these repositories was for short-term; that is the preservation of the print copies through conversion to digital copies. This observation was revealed in Anyaoku et al. (2018) study where majority of the institutions indicated that they provided long-term digital preservation in their IR in the form of information migration. Gbaje and Mohammed (2017) also noted that academic institutions in Nigeria deployed IR as a strategy for the preservation of their digital objects and assumed that creating a back-up was sufficient to ensure long-term accessibility.

Gbaje (2011) study revealed a significant finding that there was no national digital policy and implementation strategy adopted by Nigerian National Information centres. Eight years down the line, the situation is still the same. Digital preservation measures such as emulation, canonicalisation, digital archaeology, replication (Lots of Copies Keeps Stuff Safe [LOCKSS]) to mention but a few were not considered in the policies or even when setting up these repositories. However, this assumption is not in Nigeria alone, Wyk and Mostert (2014) reported a similar finding with the draft policy of the University of Zulu, South Africa. The university did not explicitly indicate preservation measures for contents in its repositories. Although issues related to long-term digital preservation as it relates to access in the future

University	Preservation	Withdrawal	Submission	Funding	Metadata use	Access	Work-flow
1. ABU	✓		✓				✓
2. UNIL	✓	✓	✓				
3. UJ	✓	✓	✓				
4. UNIL	✓		✓				
5. UDUS	✓		✓				
6. UNN	✓		✓				

Table 2.
Policy contents

are still prevalent in developed countries, some of the countries in Africa especially the sub-Saharan region are not even in the loop of these issues based on some of the management practices observed from this study. Arlitsch and ÒBrien (2014) opined that librarians were great believers in standards and have dutifully followed procedures for scanning, metadata creation, harvesting and Web services while building repositories. However, this is not the case with the ETD repositories in Nigerian federal university libraries.

None of the repositories had metadata and data reuse, which is very pertinent to digital contents on the internet. The reason for this could be because most of the repositories are not data providers on the open archive initiative-protocol for metadata harvesting (OAI-PMH) framework, which would have enabled a well-defined metadata use or re-use policy. Another reason could be because university libraries in Nigeria have not adopted research data preservation.

Electronic theses and dissertations in Nigerian institutional repositories are not well managed for effective service delivery and long-term accessibility. It is rather sad that while developed countries were already visualising the impact of ETDs via citation counts and using the data generated from them for societal impacts, Nigeria is still grappling with issues related to policy formulation and implementation, content population and even funding.

Contents

Repository administrators were requested to state ETD file content types uploaded to the repositories, content copyright ownership, measures and accessibility level.

The results from Table 3 revealed that all of the repositories have their uploaded ETD contents in portable document format (PDF). This result mirrors the findings of Gbaje and Mohammed (2017), Termens *et al.* (2015) and Hitchcock *et al.* (2007) and negates that of Rimkus *et al.* (2014). Although PDF files are the dominant file type of ETDs in Nigerian repositories, Cayabyab (2015) raised concerns about PDFs not supporting full-text search and its proprietary status as challenges to data management. Nigerian repository administrators have not considered the long-term effect funding a proprietary software can have on the preservation of ETDs; which is an issue that should be prioritised.

Conspicuously absent from the ETD contents uploaded to the repositories were audios, codes, videos and images. These file contents that were not available constitutes data sets in several research disciplines. The submission of supplementary file formats along with theses and dissertations is a relatively new phenomenon that arose as a result of digital formats of these contents. Doty *et al.* (2015), in their study, stated that in the interest of

University	PDF	HTML	Code files	Office files (.doc, .ppt, .xcl)	Audio files (.wav, .mp3)	Video files (.mpeg, .avi)	Image files
1. ABU	✓						✓
2. FOYE	✓						
3. FUTM	✓						
4. FUTO	✓						
5. UI	✓						
6. UNIL	✓						
7. UJ	✓						
8. UNILAG	✓						
9. UDUS	✓						
10. UNN	✓						

Table 3.
Content file types

replication and research transparency, data sets are being included as supplements to electronic theses and dissertations submissions. ETD initiatives in developing countries should follow this trend despite the late adoption. The major challenge, however, is not the advocacy but the readiness of libraries, especially in Nigeria to accept and preserve these contents. According to the researchers, academic libraries all over the world are offering research data archival support services in support of this new trend. However, Abduldayan et al. (2019) revealed that hacking, as a cyber threat, was a significant challenge to intellectual output and research data deposited in the repositories of specialised universities of technology in Nigeria. University libraries in Nigeria must, therefore, engage in advocacy campaigns to allay the fears of intellectual theft. The campaigns should raise issues on the counter productivity of not preserving research data. In turn, libraries should have their repositories well customised and organised to include the different file formats data sets can come and leverage on these to also increase contents.

Results from Table 4 revealed another pertinent issue with the management of ETDs in Nigeria. Majority of institutions indicated that the copyright of the ETDs belonged to both researcher and the university. Before the advent of digital forms of theses and dissertations, this was not a challenge because of visibility and accessibility issues. With electronic format, however, the issues are different because these contents can now be accessed globally. The implication of not indicating whose intellectual property theses and dissertations are can bring about a conflict of interest, with both parties not knowing the limit to which they can use these documents. It is usually believed that research studies for advanced degrees are commissioned work (submission of thesis included) in exchange for a certificate, and thus the copyright belongs to the university. This is, however, not the case in all instances, for example, in a case of third party funded advanced study, the funding university uploads the thesis to its repository, the commissioning university also uploads to its repository, even the postgraduate student might want to publish some contents from that thesis. The issue thus is who owns what and to what extent.

Table 5 results showed that Nigerian repositories had inadequate measures to protect the copyright of the ETD contents. Majority of the repositories do not even have copyright measures in place. There are reported perceived worries of students about their research studies being plagiarised when uploaded onto repositories. These worries are valid, especially in the Nigerian IR setting, where the majority of the ETD contents are open. Although open access aids the research need of scholars, inadequate copyright measures can be counterproductive for developing countries where intellectual property policies are not well documented and implemented. The use of less complicated passwords or digital watermarks, for example, would give access to users but would make direct copying of these

Table 4. ETD contents copyright ownership

University	Researcher	University	University and researcher	No idea
1. ABU	✓		✓	
2. FOYE			✓	
3. FUTM				✓
4. FUTO				✓
5. UI			✓	
6. UNIL			✓	
7. UJ			✓	
8. UNILAG				✓
9. UDUS				✓
10. UNN				

Universities	Measures not yet framed	Contents saved as images	Digital watermark	Metadata access	Passwords
ABU	✓				
FUD	✓				
FUL	✓				
FOYE	✓				
FUTM				✓	
FUTO	✓				
UI			✓		
UNIL					
UJ					
UNILAG	✓				
UDUS	✓				
UNN	✓				

Table 5.
Copyright measures

contents impossible. More complex copyright measures such as encryption should be used with caution. Termens *et al.* (2015) study highlighted that encryption could have consequences for long term preservation of the repository objects.

Table 6 showed that majority of the repositories allowed full-text download of theses without copyright measures in place. This is a source of concern because these documents could be indiscriminately used and copyright violated. Although ETDs are classified as grey literature whose copyright does not belong to commercial publishers (Schöpfel and Farace, 2010), there is always the concern about plagiarism, especially where contents can be copied. Interestingly, the situation is not peculiar to Nigeria or developing countries alone. The study of Prost and Schöpfel (2013) revealed that some repositories displayed rather low degrees of openness for theses stating reasons such as lack of awareness, intellectual property concerns and fear of plagiarism, legitimate interests and expected exploitation (publishing). However, university libraries can use copyright measures such as using passwords and restricting direct copying of contents after downloads.

System architecture
Results from Table 7 revealed that majority of the universities used institutional-based servers as against commercial or third-party servers. This result indicated that Nigerian institutional repositories have not adopted cloud computing measures for storage of ETDs four years after Ifijeh (2014) recommended that academic libraries in Nigeria should digitise

Universities	Paid accessd	Full-text download	Full-text download on request	Metadata inmformation
ABU		✓		
FOYE		✓		✓
FUTM				✓
FUTO			✓	✓
UI		✓		
UNIIL		✓		
UJ				✓
UNILAG		✓		
UDUS		✓		
UNN		✓		

Table 6.
Contents access level

S/N	Institutions	Cloud server	Institution server
1	ABU		✓
2	FOYE		✓
3	FUTM		✓
4	FUTO		✓
5	UI		✓
6	UNIL		
7	UJ	✓	✓
8	UNILAG		✓
9	UDUS		✓
10	UNN		

Table 7.
Repository server

theses and adopt the cloud computing preservation model through the operations of institutional repositories. Cayabyab (2015) also observed that none of the literature reviewed in their research article discussed the feasibility of cloud computing despite the hesitance of patronising ETD because of the reliability of storage device preservation after 15-20 years.

Interestingly, the researchers observed that the institutional repository that had its contents on cloud server did not have accessibility issues compared to the other repositories which go to show a major advantage cloud solutions have.

An overwhelming majority of Nigerian ETD repositories are not data providers on the OAI framework. The only institution that indicated that they were registered as data providers on the OAI-PMH protocol were not listed on the OAI-PMH website (www.openarchives.org/Register/BrowseSites). The reason for the inconsistency may be because of software upgrade without a corresponding update on the OAI-PMH website. This means the repository administrators did not update their records after a major software upgrade. The issue of visibility thus comes to play with the findings in Table 8. According to information on the International Federation of Library Associations and Institutions (IFLA) website, OAI-PMH is a client/server architecture protocol specification that facilitates the diffusion of metadata and supports two essential functions:

Metadata provision: an institution exposes its metadata (bibliographic records in Dublin Core) via an OAI-PMH server to enable them to be harvested by other organisations or internet search engines.

Service provision: an institution harvests metadata offered by OAI-PMH from other institutions integrating them into its search index for use in its user interface. The frequency of harvesting must correspond to the update frequency on the remote OAI server.

S/N	Institutions	OAI compliant repositories
1	Ahmadu Bello University	×
2	Federal University Oye-Ekiti	×
3	Federal University of Technology, Minna	×
4	Federal University of Technology, Owerri	×
5	University of Ibadan	×
6	University of Ilorin	×
7	University of Jos	×
8	University of Lagos	✓
9	Usman Danfodio University	×
10	University of Nigeria Nsukka	×
		×

Table 8.
OAI complaint ETD repositories

This explains the unavailability of theses and dissertations from Nigerian Universities in global databases such as DATAD and NDLTD. In addition to this is the unavailability of any networked platform that either centralises the ETDs in a database or harvests ETDs for the stand-alone repositories.

The OAI-PMH is a machine-to-machine interface provided by repository software platforms (Open and Proprietary). This protocol allows service providers to harvest and process metadata (bibliographic information) for the items in a repository. International service providers or aggregators use the data provided to feed their databases for visibility, thus making search faster. Tmava and Alemneh (2013) opined that open standards enhanced interoperability between different IR software platforms and online search engines, such as Google, to index metadata elements consistently and offer useful search capabilities. The minimum standard of interoperability for repositories is the OAI-PMH (Shearer et al., 2015). It is also the most used protocol among ETD providers (Hakimjavadi and Masrek, 2013).

In a related study, Arlitsch and ÒBrien (2014) carried out a search engine optimisation study in University of Utah's digital repository that revealed low indexing ratio on Google Scholar. A further subsequent study found out that those repositories that used Google Scholar recommended metadata schemas expressed in HTML meta tags experienced significantly higher indexing ratios. Tmava and Alemneh (2013) supported this finding when they stated that regardless of other contributing factors, rich metadata that is consistently encoded was responsible for making the digital items more discoverable. These studies were, however, focused on search engine optimisation and not necessarily interoperability with metadata harvesters. Majority of the repositories in the present study were not registered on the protocols that enable other information systems to collect and gather non-linkrot metadata outside the repositories' environment. Further studies can be carried out on the usability of the metadata in Nigerian IRs to find out this gap.

In Nigeria, the poor synergy between the information technology (IT) units of universities and the librarians causes technical issues such as search optimisation and interoperability. The researchers observed that in most cases, the IT units customised their repositories without due consultation and input from the librarians to find out how these repositories can be tailored to meet the needs of its users.

Findings from the interview

Responses on policy documents from some of the repository administrators indicated that the institutions had IR policies not no specified ETD policy. One of the IR administrators reply was "*We have an institutional repository (IR) policy but not a specified ETD policy; the IR policy covers some of the issues on ETD management*".

Responses on the contents of the policy on preservation revealed that most of the IRs used information migration (from print to electronic) through digitisation and thought the technique was sufficient as a preservation technique. Several repository administrators response to the preservation technique indicated in the policy was:

"We digitise back-log issues of theses and dissertations and upload the same to the repositories. We also back-up the uploads daily, although not to any external back-up".

Findings on the submission policy also revealed that in all the institutions, postgraduate students do not upload directly to the repository. Majority of the responses were "Postgraduate students do not submit directly to the repository; they submit soft copies of theses to the postgraduate school, that in turn sends them to the library".

When asked who uploads these soft copies to the repositories, an IR administrator said "*I and some randomly trained library staff.*"

Majority of the IR administrators were unaware of the OAI-PMH framework. Majority of the responses were *during the development and implementation of the repository, we were unaware of the OAI-PMH protocol. We were only aware of GOOGLE search engine optimisation.*

Research implication and conclusion

Conceptualising the digital library management system for ETDs in Nigeria revealed some salient issues. The ETD initiatives in repositories of Nigerian federal universities have not made remarkable progress as digital libraries based on policy, content and system architecture. This research study concluded that electronic theses and dissertations in Nigerian institutional repositories are not well managed for effective service delivery and long-term accessibility. The ill-management of the ETD initiatives is the reason for the poor global visibility and accessibility of these research output from this part of Africa. It is rather sad that while developed countries were already visualising the impact of ETDs via citation counts and using the data generated from them for societal impacts, developing countries are still grappling with issues related to policy formulation and implementation and content population. It goes without saying that majority of the institutional repositories of federal government universities in Nigeria were set up due to what Bringula (2016) referred to as "normative pressure" (institutions adopted practices or innovations because stakeholders are embracing the same practice) with little or no sustainable plans in most cases. A pointer to this is the partial inclusion of librarians in some universities as against the staff from the information technology unit in the initial implementation committee for repositories; the implication was thus shaky and ill-managed repositories. This has led to the near-comatose state of most of these repositories with pertinent issues involving the core of librarianship such as acquisition, preservation and even dissemination not properly stated where there are policies. Incidentally, some of the institutional repositories from developed countries published challenges encountered while setting up their repositories and managing the research output therein with solutions in some cases over a decade ago. A source of concern is why Nigeria did not leverage these solutions. Many types of researches that solve most of the domestic problems in developing countries are buried in these theses and dissertations which repositories would have exposed.

The following recommendations are, therefore proposed:

- Policy development specifically for ETD initiatives for university libraries in Nigeria should be initiated with specific implementation strategies for content population by postgraduate students, copyright issues and even funding.
- Dedicated cloud computing solutions should be embraced for repositories. This would go a long way in easing the technical burden of maintaining the repositories. Thus, library staff would be able to concentrate on quality content population.
- Adopting the OAI-PMH initiative would also help to increase the visibility of repositories from Nigeria.
- Institutional repositories should include value-added services such as scholarly workflow facilitator and/or networking hub.

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