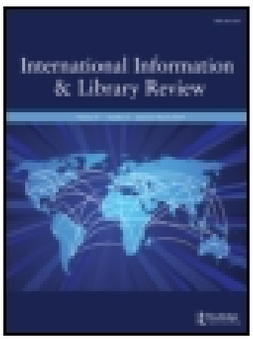

International Information & Library Review

ISSN: 1057-2317 (Print) 1095-9297 (Online) Journal homepage: https://www.tandfonline.com/loi/ulbr20

Technological and Infrastructural Issues of Institutional Repositories in University Libraries in Nigeria: And the Way Forward

Francisca N. Okoroma

To cite this article: Francisca N. Okoroma (2019): Technological and Infrastructural Issues of Institutional Repositories in University Libraries in Nigeria: And the Way Forward, International Information & Library Review, DOI: 10.1080/10572317.2018.1491710

To link to this article: https://doi.org/10.1080/10572317.2018.1491710

Published online: 07 Jan 2019.

INTERNATIONAL INFORMATION & LIBRARY REVIEW
https://doi.org/10.1080/10572317.2018.1491710

Routledge
Taylor & Francis Group

GLOBAL POSTCARDS COLUMN

Jacqueline Solis, Column Editor, Director of Research and Instructional Services, University of North Carolina, Chapel Hill; Robin L. Kear, Column Editor, Liaison Librarian, University of Pittsburgh

COLUMN EDITOR'S NOTES

Welcome to the Global Postcards column! We are happy to bring you news and projects from around the world. Our column this month, by Francisca Okoroma from the University of Ibadan in Ibadan, Nigeria, presents a snapshot of the use of institutional repositories in academic libraries in Nigeria. If you would like to send a submission for a future column, please contact either of the column's co-editors: Jacqueline Solis, jsolis@email.unc.edu, and Robin Kear, rlk25@pitt.edu.

Technological and Infrastructural Issues of Institutional Repositories in University Libraries in Nigeria: And the Way Forward

Francisca N. Okoroma

Kenneth Dike Library, University of Ibadan, Ibadan, Oyo, Nigeria

ABSTRACT

Technology and infrastructure are prerequisites in the development of any institutional repository (IR). These however constitute major issues contending with the sustenance of institutional repositories especially in the developing countries. Extant literature focused on the awareness, benefits and the various IR activities across the globe. This study investigated the technological and infrastructural challenges of institutional repositories in university libraries in Nigeria. The study adopted the descriptive survey research design. A multistage sampling procedure was employed to sample 844 lecturers of the universities in Nigeria and 8 heads of the digitization section of the libraries. Data generated were analyzed using descriptive statistics. The findings revealed that low bandwidth, inadequate and obsolete hardware and software components coupled with low server configuration, and erratic power supply, occasioned by poor funding are among the technological and infrastructural problems affecting institutional repositories in university libraries in Nigeria. The study advocated for the provision of more and sufficient bandwidth for the library system, good configuration of computer systems, the use of inverters and solar systems to ensure uninterrupted power supply and enhanced funding through special IR budgetary allocation by the universities' management.

KEYWORDS

Institutional repositories; university libraries; Nigeria; technology and infrastructure

Introduction

Access to relevant and quality literature has been an issue especially the local content. Though universities are the major center for research and quality literature output, but there is a divide between universities' research output and the users of the information (Debachere, 1995; Okoroma, 2011). This is partly linked to the peer-reviewed journal subscription crisis, the only main acceptable method of dissemination of research in academia. Open Access and Open Content journals emerged in the mid-1990 as an intervention in the area of electronic journals. Institutional repository was born as an outgrowth of open access initiatives.

An institutional repository (IR) concentrates on the institutional products created by academics or other institutions' researchers, making it easier to demonstrate their scientific, social and financial values (Dabholkar et al., 2008). Institutional repositories (IRs) give the opportunity to faculties and research scholars from universities to freely publish and access the results of their research activities, especially now that it is obvious to the academic community that the traditional model of scholarly communication via subscription-based journals serves more to hinder rather than expand access to research output. Velterop (2004) reported that "in the light of emerging trends in digital scholarly communication, institutional repositories

CONTACT Francisca N. Okoroma frankaonyeka@yahoo.com Kenneth Dike Library, University of Ibadan, Ibadan, Oyo, P. O. Box 14238, Nigeria.

play an important role in the preservation and dissemination of institutional research outputs which in turn becomes a constituent part of a global research output." Dhanavandan and Tamizhchelvan (2015) defines IR as an online archive for the intellectual output of a particular institution for collecting, preserving, and disseminating the research community. Institutional repositories provide unlimited visibility and maximum access to the wealth of scientific and technological information and knowledge embedded in research around the world, as well as great opportunities which are very essential for societal development. Institutional repository has a way of packaging an institutions intellectual output and showcasing it to the world at a glance.

Universities and other academic institutions all over the world are embracing IR considering the enormous benefits. For instance, the concepts of Open Access (OA) and institutional repository have come to the forefront of Turkish information management landscape with the formation of the Consortium of Anatolian University Libraries (ANKOS) in April, 2004. In 2003, The Middle East Technical University Library Electronic Theses and Dissertations Archive was established and it became the first Turkish member of the Networked Digital Library of Theses and Dissertations. Ohio State University's Knowledge Bank provides another example of a project that addresses the objectives of an institutional repository while serving broader digital resource goals. The Utrecht repository is Open Archive Initiative (OAI) compliant. The Institutional Repository of Utrecht University project includes a faculty personal home page project, which the library hopes will encourage faculty participation in online posting of their research. Other universities that have implemented e-prints solutions include Cal Tech, the University of Nottingham, University of Glasgow, and the Australian National University.

Christain (2008) reported that academic and research institutions in many developing countries like Nigeria are still battling to overcome many challenges in attempt to make their research outputs openly accessible by means of internet technologies like institutional repositories. Christian further noted that institutions in South Africa seems to be making greater progress in terms of development and deployment of institutional repositories while their counterparts in Nigeria are bugged down by a complex combination of problems. The Open DOAR (2014) also ascertained a dismal record of adoption of IRs in Nigeria. Out of 3,370 institutional repositories in the world, Africa has only 95 (3.7%) repositories and Nigeria has just 8 (7.9%) out of 95 repositories in Africa. There is also the problem of sustenance, as one of the institutional repositories in Nigeria (Ahmadu Belo University) experienced "The crashing of the Dspace server in 2010 due to power surge leading to the loss of over 1200 scanned theses and dissertations" (Abdulkadir & Zakari, 2013). This brings to the lime light the technological and infrastructural issues in the sustenance of institutional repositories in Nigerian university libraries. Eke (2011) highlighted some of the challenges associated with institutional repositories in Nigeria as lack of awareness, attitude of academic, legal aspect/copyright, funds, technological, infrastructural issues, and policy development.

Technological and infrastructural issues need to be addressed and strengthened if the development and sustenance of institutional repositories are to be fully achieved in Nigeria. This is so due to the fact that an institutional repository will be inevitably supported by a set of information technologies at every given point in time. A key part of the services that comprise an institutional repository is the management of technological changes, and the migration of digital content from one set of technologies to the next as part of the organizational commitment to providing repository services (Lynch & Lippincott, 2005). It should be noted that in the age of print, information was relatively simple to preserve since paper is a durable format when made properly and stored under a conducive environment, but in the digital age, the preservation of information has become very complex. This is as a result of digital information being fragile and faces many threats, including technological obsolescence and the deterioration of digital storage media (Li & Banach, 2011). Bailey et al. (2006) ascertained that preservation is viewed as one of the top three benefits of the IR. In this regard, there is

need to identify the file formats for which IRs will provide long-term access. All these are concerns on institutional repositories that need to be dealt with in order to achieve a sustainable IR.

To tackle the technological and infrastructural issues of IRs, there is need to examine these factors and identify solutions. This research seeks to investigate the technological and infrastructural problems of IRs in university libraries in Nigeria in order to enhance IR sustainability and accelerate the deployment rate, thereby maximizing access, utilization and impact of research out.

Literature review

Institutional repository activities in universities in Nigeria

Nigeria has a total of 141 universities of which 40 are federal and state owned respectively while 61 are private universities. Nigeria has more universities than any country in Sub-Saharan Africa (NUC, 2016). These universities function as a focal point for academic research in the country, making the volume of research output originating from academic institutions and addressing local problems in Nigeria to be very high. Egwunuyenga (2008) has attributed this to the fact that research is made compulsory for both lecturers and students either by job description or by prescribed academic program of study. It is obvious then that many of research outputs which address the issues that are endemic to the region should be given wide circulation so that the results of the research can be applied in tackling societal problems. Despite the increase in scholarly output, the visibility and impact of research output in Nigeria is still very low because scholarly communication, like in other developing countries in Africa is mainly print based which has low visibility (Utulu and Bolarinwa, 2009). This has resulted in limited access to scholarly publications, as the cost of journals subscription is quite high coupled with inadequate funding of university libraries.

Recognizing the importance of a new mode of information access, academic libraries in Nigeria decided to take the responsibility for automation. Funding bodies such as the Federal Ministry of Education in Nigeria introduced the Virtual Library Project, which pulls together resources electronically, connecting all the academic libraries in Nigeria, with the hub at the National Universities Commission (Federal Ministry of Education 2000).

In 2008 an international workshop was held in Ahmadu Bello University Zaria, on open access repositories, where Nigerian universities and research libraries were encouraged to organize their scholarly output into institutional repositories, in order to make their research works available both nationally and internationally through open access. Bozimo (2008) and Okojie (2008) supported the call for open access through institutional repositories. These authors were of the view that the paradigm would make Nigerian researchers and librarians gain leverage and become part of international community of researchers. It should be noted that whether through a consortium or by independent subscription, academic libraries acquire and disseminate electronic portals and databases. The Consortium of Nigerian University Libraries (NULIB) has subscribed to EBSCOhost. Internet portals include Access to Global Online Research in Agriculture (AGORA), Health Internetwork Access to Research Initiatives (HINARI), Online Access to Research in the Environment (OARE), Database of African Theses and Dissertation (DATAD), and many offline databases including MEDLINE. These are global information resources which could be accessed through academic library gateways.

In Nigerian academic institutions, University of Jos library played a leadership role in the digitization and provision of universal access to research output. National Universities Commission (2017) advocated that academic libraries must provide access to both print and electronic resources to serve users and to increase the visibility of their institutions, and as a measure of prestige. Anunobi and Okoye (2008) stated that "for Kashim Ibrahim library, Unesco's sponsorship of the heads of six University librarians to a workshop on the use of the Greenstone open source software, sparked the library's initial interest in digitization. They added that the digitization of theses and dissertations at the university libraries of Jos and the Obafemi Awolowo University, under the AAU-DATAD program, provided a model for ABU to start digitizing its post-graduate

theses and dissertations. That means that training and bold successful steps of some libraries will serve as important form of motivation for other libraries towards the establishment of IRs.

Preliminary findings revealed that there are only five Universities with functioning open access IRs in Nigeria. They are Ahmadu Bello University, Zaria; Covenant University, Ota; Federal University of Technology, Akure; University of Jos; and University of Nigeria, Nsukka. There are some other universities in Nigeria that are at various stages in the establishment of IR. For example, University of Ibadan, Federal University of Technology, Ondo State and Federal University of Technology, Oye-Ekiti have adopted institutional repositories but at various stages. It could be seen that the development of IR in universities in Nigeria is relatively new, the adoption rate is very slow. There are few previous studies on IRs in universities in Nigeria (Christain, 2008; Nwokedi, 2011) and none of the studies have actually addressed the technological and infrastructure issues of institutional repositories.

Technological and infrastructural factors and institutional repository

Dabholkar et al. (2008) reported that for a full-fledged implementation of Institutional Repository, there is a need for proper infrastructure. The details of these requirements are: Hardware requirements: Two Personal Computers with the P-IV configuration, a separate high-end server which is functional 24/7 is required (Dabholkar et al., 2008).There is several open source software available which can be used for building an institutional repository e.g Greenstone Digital Library Software (GSDL), EPrint and DSpace. For building an Institutional Repository in TIFR, it was decided to opt for DSpace for the following reasons.

1. DSpace is completely customizable to fit the needs. It has flexibility, functionality and can be maintained with minimum staff time. It has Qualified Dublin Core.
2. Its structure allows in organizing the repository collections according to various departments in the Institute.
3. DSpace is being used by many libraries. Since this software is updated regularly, it helps in enhancing the performance of the retrieval system.

Lynch and Lippincott (2005) collaborated that DSpace was the dominant content management package listed by the respondents.

Developing institutional repositories may not necessarily require that each institution act entirely on its own. For many colleges and universities, existing state or regional institutional or library consortia will provide a logical infrastructure for implementing institutional repositories via collective development. Such cooperation could deliver economies of scale and help institutions avoid the needless replication of technical systems (Crow, 2002). Indeed, consortia might well prove the fastest path to proliferating institutional repositories and attaining a critical mass of open access content.

Onyancha et al. (2012) discussed the various activities that have been undertaken at the United Nations Economic Commission of Africa (UNECA) to realize the IRs project including; highly customized Dspace installation to support the MARC21 metadata, digitization, migration of metadata from the Library Integrated Management System (HORIZON) and, customization of the Dspace workflow to enable review of imported records. Concerning submission process in digitization. Dabholkar et al. (2008) noted that submission of any document has to pass through a seven-step workflow process. The first three steps include basic descriptions about the materials and Dublin Core metadata elements like author, title, publisher etc. The fourth step involves uploading of the digital document i.e. PDF and image files which are earlier stored in the computers. The fifth step includes verification and making of corrections, if any, to the data submitted in the earlier stages. The sixth step presents the license agreement and the last step confirms the submission process. After submission is complete, the submitted item goes through other formalities like review, edit, or approval in accordance with the established policies. These entire workflow processes demand appropriate and efficient infrastructure and technological knowhow.

Herbert (2002) ascertained that institutional repository systems must be able to support

interoperability in order to provide access via multiple search engines and other discovery tools. He continued that an institution does not necessarily need to implement searching and indexing functionality to satisfy this demand (it could simply maintain and expose metadata, allowing other services to harvest and search the content) as this simplicity lowers the barrier to repository operation for many institutions, as it only requires a file system to hold the content and the ability to create and share metadata with external systems.

Jackson (2011) stated that, "the rate of change in computing technologies is such that information can be rendered inaccessible within a decade." One key question associated with the preservation of e-prints is "which ones should be preserved?" This is where selection and retention criteria are important since it is essential to recognize that this is not necessarily an "all or nothing" situation. Digital information is lost when it is left unattended while hardware, software and media continue to develop. Without intervention, an e-print may be subject to media degradation within a few years. Even if the e-print is securely backed-up, a few more years will see the e-print's content become inaccessible as software and hardware change. Without a strong institutional commitment, institutional e-print repositories will be unable to preserve their holdings, and they may also struggle to convince faculty to deposit work.

From the ongoing preservation is a major challenge in IRs. Teper and Beth (2002) ascertained that digital preservation and long-term access which are the aim of institutional repositories are inextricably linked: each being largely meaningless without the other. Providing long-term or sustainable access to digital objects in the repository requires considerable planning and resource commitments. The goals motivating an institution to create and maintain a digital repository—whether pan-institutional, as a component in the changing structure of scholarly communication, or institution-centric, require that users beyond the institution's community gain access to the content.

Bailey et al. (2006) found that preservation is viewed as one of the top three benefits of the IR. From a preservation policy point of view, the identification of the file formats for which IRs will provide long-term access is very vital, thus preservation is a vital decision. When making decisions about preserving file formats, Jones et al., (2006) suggested that IR staff should answer these questions: Is the file format an open standard/format, widely used? Is the file format and associated technology likely to be preserved? Are the contents of the file human readable? And is the file format itself human read-able?" Bailey reported that 74% of the operational IRs in ARL libraries accepted any digital file type, adding that "Relatively few (26%) are committed to functional preservation of every file type.

The UK SHERPA project has the construction of a series of institutional OAI-compliant e-print repositories and the investigation of the preservation of this content as its two main goals. The full project title "Securing a Hybrid Environment for Research Preservation and Access" highlights this dual track approach of access and preservation aims. E-prints usually contain only text and static images, which are among the simplest forms of electronic content to preserve. They seldom contain dynamic content, such as audio or real-time simulations, again probably because e-prints are still closely tied to traditional ideas of paper pre-prints, where such types of content are impossible. They are usually written and stored in ways that are designed to facilitate paper printing and publication. The file formats, metadata requirements and software applications used to manage and view e-prints can all be used to manage and disseminate other forms of electronic content, and this means that the e-prints community will not have to solve the technical problems which are unique to e-prints.

Nkiko, Bolu and Michaei (n.d.) noted that back-up systems are strategic to forestall intrusion and mitigate effects of possible disasters. In determining the appropriate metadata to be adopted, attention must be paid to installation requirements, functionality, performance, cost, security, usability, work flow, scalability, and interoperability issues.

Objectives of the study

The main objective of the study is to investigate the technological and infrastructural problems of

Table 1. Questionnaire distribution and response rate.

Universities used in the study	Number administered	Number returned	Percentage rate of response
University of Nigeria Nsuka (UNN)	150	141 (94%)	18.8
Federal University, Oye-Ekiti (FUOYE)	83	78 (94)	10.4
Federal University of Technology, Akure, (FUTA)	68	43 (63%)	5.7
University of Jos (UNIJOS)	130	126 (97%)	16.8
Ahmadu-Bello University (ABU)	168	160 (93%)	21.3
Obafemi Awolowo University (O A U)	110	56 (51%)	7.5
University of Ibadan (UI)	154	104 (68%)	13.9
Covenant University (CU)	43	43 (100%)	5.6
Total	906	751	100

institutional repositories in university libraries in Nigeria.

The specific objectives are to

1. find out the technological challenges of institutional repositories in university libraries in Nigeria;
2. to identify the infrastructural factors hindering the development and sustenance of IRs in University libraries in Nigeria; and
3. find out solutions to the technological and infrastructural challenges of institutional repositories in university libraries in Nigeria.

Methodology

The study adopted a survey research design. It involved quantitative and qualitative methods of data collection. The study adopted a multistage sampling procedure. The purposive sampling technique was used in the selection of eight institutions that participated in the study. These institutions were Ahmadu Bello University, Covenant University Ota, Ogun State, Federal University of Technology, Ondo State, Obafemi Awolowo University, Osun State, University of Ibadan, Ibadan, Oyo State, University of Jos, Plateau State, University of Nigeria, Nsukka, Enugu State and the Federal University, Oye Ekiti, Ekiti State. These institutions were purposively selected because they were the only universities adopting institutional repository in Nigeria. The study further adopted the purposive sampling technique to sample three (3) faculties of the institutions. These faculties were the faculties of sciences, social sciences, and humanities respectively. The study also employed the simple random sampling techniques of the balloting type to identify 844 lecturers (10% of the population) and 24 Library Digital Staff/Librarians, totaling 868. Data collected was analyzed using descriptive statistics which involves frequency counts and simple percentages.

Result

The findings are highlighted under four headings: (A) Demographic information; (B) Technological challenges of institutional repositories in university libraries in Nigeria; (C) Infrastructural factors hindering the development and sustenance of IRs in University libraries in Nigeria; and (D) Solutions to the problems of technology and infrastructure in IR management.

Demographic information

Table 1 reveals the distribution of respondents by their rate of returns of the questionnaire from the Universities. The table reveals that out of 906 copies of the questionnaire administered to the respondents in the eight universities, 751 copies of the research instruments were adequately filled and returned, giving a response rate of 83%. The table shows that the highest number of the participants was from Ahmadu-Bello University with 168 copies of questionnaire distributed and 160 copies returned. This is followed by UNN where 150 questionnaire copies were administered and 141 copies were returned. In University of Jos 130 copies of the questionnaire were distributed and 122 were returned. At University of Ibadan 154 copies of the questionnaire were distributed and 104 copies were returned. Eighty-three copies of the research instruments were administered at the Federal University, Oye-Ekiti and 78 copies were returned. A total of 110 copies of the questionnaire were administered in Obafemi Awolowo University and 56 copies were returned, while in Federal University of Technology,

Table 2. Distribution of respondents by designation.

	Designation of respondents				
University	Lecturer II	Lecturer I	Senior Lecturer	Professor	Total
UNN	59	42	27	12	140
FUOYE	28	27	10	13	78
FUTA	13	15	8	7	43
UNIJOS	47	38	26	15	126
ABU	73	52	18	17	160
OAU	21	14	16	5	56
UI	53	24	19	8	104
CU	16	12	9	5	42
Total	310	224	133	82	749

Akure, Ondo State 68 copies of the questionnaire were distributed, and only 43 copies of the questionnaire were returned, while Covenant University had the highest return rate of questionnaire, 43 copies of the questionnaire were administered and all the 43 questionnaire copies were returned. Table 1 above also revealed that FUTA and Covenant universities had the least percentage of representation due to their sparse population in terms of academic staff while ABU, UNN, Jos and UI, ranked the highest in population and representation for the study.

Table 2 shows the distribution of the respondents by designation, the result reveals that, 310 (41.5%) of the respondents were Lecturers II, 224 (29.9%) were Lecturer I, 133 (17.7%) Senior Lecturers and 82 (10.9%) were in the Professorial cadre. lecturer II has the highest number of respondents while professors were the least. Out of the 310 lecturer II respondents were 73 persons from Amadu-bello University, 59 from University of Nigeria, and 47 were from University of Jos. University of Ibadan has 53 persons while Federal University, Oye-Ekiti has 28, 21 from OAU, 13 from University of Technology, Akure, and 16 respondents were from covenant University.

Technological challenges of institutional repositories in university libraries in Nigeria

The technological challenges to the sustenance of institutional repositories in university libraries in Nigeria are shown in Tables 3 and 4.

Table 3 revealed the Technological factors affecting the sustanance of institutional repositories in university libraries in Nigeria as noted by the lecturers in Nigerian universities. The table ascertained that there are technological issues contending with the sustenance of IRs in university libraries in Nigeria. Among the respondents 78% agreed that technological changes is a problem of IR, while 87.6% agreed that Intellectual property right is concern for researchers. Also 74% of the lecturers ascertained that software adoption is an issue, 78% agreed there is hardware problem, 73.1% agreed that technical support is a challenge, and 73.1% supported that there is a great deal of uncertainty about preserving e-prints in IRs. The result further reveals that, 76% of the respondents agreed on security issues, while 72.5% said content management is a problem. On the other hand 71.3% ascertained that deposit and withdrawal services are issues, as well as Access Control and Rights Management: to restrict access to the information when open access is premature or not desirable is not certain. Whereas, 67.1% opined that policy development specific to IRs is yet to be established in IR sustenance.

To further determine the technological challenges affecting the sustenance of institutional repository in university libraries in Nigeria, questionnaire for digitization staff and structured interview for IR managers were used for data collection. The technological factors affecting the sustenance of institutional repositories in university libraries in Nigeria as identified by the digitization staff of the eight universities involved in the study are highlighted on Table 4.

The opinion of the digitization personnel from the eight universities involved in the study as highlighted on Table 4 are as follow: Most of the respondents, 7 (88%) out of the 8 respondents avert that copyright issues are part of the technological issues they are facing in the bid to sustain their IRs. Their reason being that, some authors are smart, and they copy other researchers' work in such a way that the existing software for dictating plagiarism does not dictate any form of copyright infringement. All the 8 (100%) persons representing the digitization personnel in the universities surveyed ascertained that there is the problem of low bandwidth which has resulted into irregularity in internet access. Surprisingly, only 1 person reported inadequate expertise, and 2 persons acknowledged that there are low server configuration, and inconsistency of publication

Table 3. Technological challenges of institutional repositories in university libraries in Nigeria.

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
Technological changes is a problem to IR sustenance	229 (31.4%)	338 (46.4%)	120 (16.5%)	42 (5.6%)
Intellectual property right is concern for researchers.	360 (49.2%)	281 (38.4%)	63 (8.6%)	27 (3.7%)
Software adoption is an issue	250 (34.2%)	289 (39.6%)	143 (19.6%)	48 (6.6%)
Inadequate and up-to-date hardware.	241 (33.0%)	326 (44.7%)	121 (16.6%)	42 (5.8%)
There is a great deal of uncertainty about preserving e-prints in IRs.	210 (28.8%)	323 (44.3%)	137 (18.8%)	58 (8.0%)
Technical support is a challenge	243 (33.5%)	339 (46.8%)	108 (14.9%)	35 (4.8%)
There is security issue	206 (28.4%)	346(47.7%)	122 (16.8%)	52 (7.2%)
Content management is a problem.	188 (25.9%)	338 (46.6%)	152 (21.0%)	47 (6.5%)
Deposit and Withdrawal Services are issues.	187 (25.9%)	328 (45.4%)	160 (22.2%)	47 (6.5%)
Access Control and Rights Management: to restrict access to the information when open access is premature or not desirable is not certain.	187 (26.0%)	325 (45.3%)	165 (23.0%)	41 (5.7%)
Policy development specific to IRs is yet to be established.	163 (22.9%)	315 (44.2%)	172 (24.1%)	63 (8.8%)

Table 4. Technological challenges to the sustenance of institutional repositories in university libraries in Nigeria by digitization personnel.

Technological challenges affecting the Sustenance of Institutional Repositories in University libraries in Nigeria	Frequency	Percentage%
Copyright, Plagiarism	7	88
Poor Network system	3	38
Inadequate Bandwidth	8	100
Low server configuration	2	25
Erratic power supply	5	63
Inadequate fund for the management of IR	3	38
Poor submission process	4	50
Inadequate expertise	1	13
Publication center are not consistent enough	2	25

centers in Nigeria. That means that, experts are deployed to handle institutional repositories in the university libraries in Nigeria. Some other technological factors affecting the sustenance of institutional repositories in university libraries in Nigeria as exposed by the respondents are: poor network system, erratic power supply, inadequate fund for the management of IR and poor submission process.

Apart from the exposure of the technological challenges affecting the sustenance of institutional repositories in university libraries in Nigeria by the digitization personnel, as revealed in Table 4, the structured interview respondents (the heads of digitization section of the libraries) also averted that technological obsolesce, inadequate fund for the implementation and management of IR, low server configuration, coupled with inconsistent and inadequate publication centers and expertise to handle the system are among the technological challenges affecting the sustenance of institutional repositories in university libraries in Nigeria.

Infrastructural factors hindering the development and sustenance of IRs in university libraries in Nigeria

The result of the structured interview with the Systems' management heads revealed the following infrastructural problems inhibiting the sustenance of institutional repositories in Nigerian University libraries:

1. inadequate and poor configuration of computer systems
2. erratic power supply and inadequate internet facilities

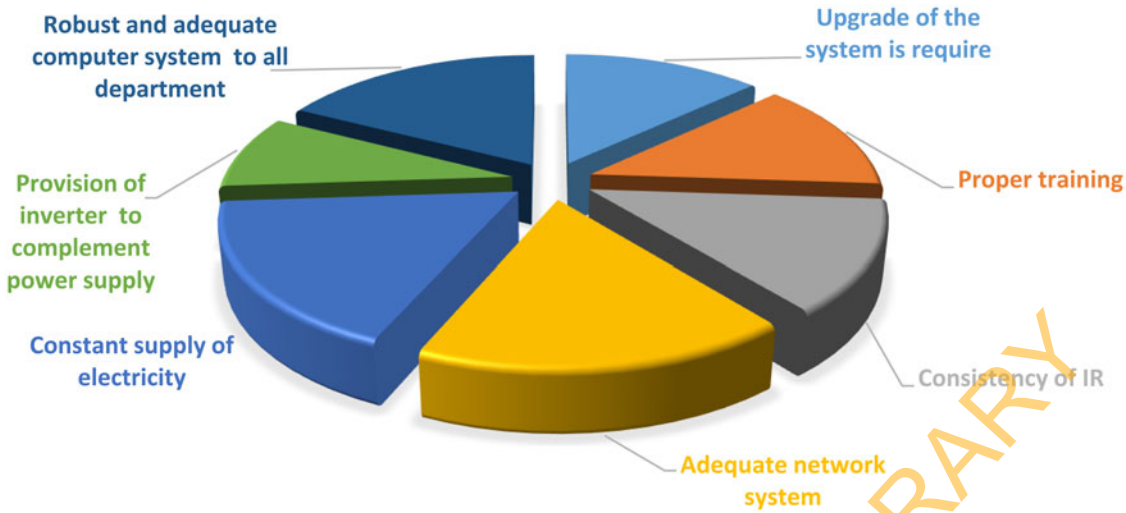

Figure 1. Solutions to the technological and infrastructural challenges of institutional repositories in university libraries in Nigeria.

3. obsolete equipment and connectivity issues

Some of the hardware configurations requirements for IR as identified in the survey are: scanner HP N9120 and HP ScanJet 55090, 2 HP Desktop, Intel Pentium CPU Due Core, 2.00GZ, 1.0 Gig Ram, Window7, Hard disk 250gig. But most of the universities surveyed (with the exception of Covenant University) have just a few work stations for their digitization processes, even the systems are obsolete. For instance in terms of operating systems, the current and up to date operating system is windows 10, whereas majority of the universities are still running on windows XP. One can see the gap between the use of operating systems, from XP to Vister to Windows 7 to Windows 8 and now. This means that both the hardware and software are obsolete. Obafemi Awolowo University reported that the available server could not host their IR, so they had to subscribe to external hosting for ease of accessibility. Apart from inadequacy of the hardware, they also have issues with their scanners. Federal University, Oye-Ekiti and University of Jos complained of erratic power supply, inadequate and poor computer configuration and networking system which are mainly occasioned by poor funding.

In terms of internet facilities and connectivity, the heads of digitization unit expressed that the bandwidth being used by the universities' libraries is too low when compared to the volumes required for full internet access by each university library. This is now resulting into constant network failures and interruption in the digitization processes. For example, in Kenneth Dike Library, as much as 20 megabytes of bandwidth is required for an efficient running of the system, but the available bandwidth for the library is as low as 10 megabytes, and this is not even regular. The head of digitization unit expressed that 'The library does not have autonomy over the distribution of bandwidth within the university rather it is the ICT center that has been given the mandate". These have adverse effect on the ongoing digitization processes.

Data on the respondents' recommendations on how to resolve the technological and infrastructural challenges of institutional repositories in university libraries in Nigeria are presented in Figure 1.

Solutions to the technological and infrastructural challenges of institutional repositories in university libraries in Nigeria

The lecturers' recommendations on how to resolve technological and infrastructural challenges of institutional repositories in university libraries in Nigeria are highlighted on Figure 1. While 80% of the respondents suggested constant supply of power through inverters, generators and solar energy, 60% advocated for adequate network system and consistency of IRs in Nigeria respectively, in order to ensure uniformity and collaboration. Furthermore, 40% of the

respondents recommended robust and adequate provision of computer systems to all the departments, while 30% respectively proposed upgrading of the systems and training of the lecturers and other faculty staff on IR system.

The result from the interview with the head of digitization unit further collaborated that the solutions to the technological and infrastructural factors affecting institutional repositories in university libraries in Nigeria have to include faculty fellowships (to enlighten the faculty members on IR and its benefits), availability of adequate network system, constant supply of electricity through backup generators, backup plan for the server used for the IRs, robust and adequate provision of computer systems to all departments, regular upgrading of the systems, adequate bandwidth, proper and regular training of staff to keep up with trends in the maintenance of IRs as well as consistency of the institutional repositories in Nigeria.

To resolve the infrastructural issues, the interview respondents further advised that it is important that the library should be given adequate priority in the distribution of bandwidth. The respondents further ascertained that there should be good configuration of computer systems with scanners, and updating from time to time, coupled with uninterrupted power supply through the use of inverters and solar system. These should be backed up with more funding through special fund allocation for IRs by the government and university management.

Discussions

The technological and infrastructural challenges affecting institutional repositories in universities in Nigeria as discovered in the survey are low and irregular bandwidth, poor network system, insufficient and obsolete hardware and software respectively; lack of regular trainings for both digitization staff and faculty members on IR matters and inadequate fund for the procurement and management of IR infrastructure amongst others. The respondents emphasized the dire need for universities to make special arrangement for regular availability of the internet for IRs personnel to work with, in order to hasten the digitization process of IRs in universities in Nigeria. Most of the universities' respondents complained of inadequate bandwidth for the day to day running of the system. As noted, the digitization unit head from Kenneth Dike Library complained that only 10 megabytes of bandwidth was made available to run their library system, which is just half of the required bandwidth for an efficient running of the system, and that was not even regular. It was ascertained that the library does not have autonomy over the distribution of bandwidth within the university; rather it is only the ICT center that has been given the mandate. Considering the fact that IR system must be supported by a set of information technologies at every given point in time, the inadequacy of bandwidth distribution is a major problem hampering the development of IRs in Nigeria. With fluctuations in the internet and power surge, the stability of data in the repository cannot be guaranteed.

The result of the structured interview further collaborated that: inadequate and poor configuration of computer systems and updates, coupled with internet facilities/connectivity issues and erratic power supply which are occasioned by poor funding are among the infrastructural factors that are hindering the sustenance of IRs in university libraries in Nigeria. Most of the universities surveyed (with the exception of Covenant University) have few work stations for their digitization processes. It is expedient that infrastructural facilities available for IRs in university libraries in Nigeria should be regularly reviewed and upgraded as most of the universities are presently managing their IRs with few work stations for their digitization processes and obsolete computer systems. For instance in terms of operating systems, majority of the universities are still running on Windows XP in contrast to current Windows 10. This means that both the hardware and software are obsolete. All these translate into slow and inefficient running of the systems.

The findings of this study are in line with Teper and Beth (2002), who maintained that, management and preservation is a major challenge in IRs. According to Earwage (2008) and Eke (2011), interesting issues that can be a

barrier to institutional repositories are lack of expertise in every organization to promote creation of institutional archives and encourage scientists to place their papers in them, the lack of infrastructural facilities like hardware and connectivity of high bandwidth in the higher institutions.

Furthermore, copyright issues are part of the technological issues that are facing the sustenance of IRs in University libraries in Nigeria. The reason given by the respondents is that, some of the authors are smart when plagiarizing other authors' work; they copy in such a way that the existing software for dictating plagiarism does not dictate any form of copyright infringement. This makes the culprits to get away with their fraudulent acts.

To resolve the issues, the interview respondents noted that it is important that the libraries should be given adequate priority in the distribution of bandwidth to ensure constant internet access. They further ascertained that there should be adequate and good configuration of computer systems with scanners and updating from time to time, coupled with uninterrupted power supply through the use of inverters and solar systems. These are very inevitable as each phase of IR procedure requires the use of the internet and appropriate equipments.

Conclusion

Technological and infrastructural factors have significant effect on the implementation and sustenance of institutional repositories in universities in Nigeria. Improving on the bandwidth distribution to university libraries, adequate and good configuration of computer systems with scanners and updating from time to time, coupled with uninterrupted power supply through the use of inverters and solar systems and more financial interventions by the government and philanthropic organizations will result in a higher level of adoption and sustenance of IRs in Nigeria.

Disclosure statement

No potential conflict of interest was reported by the author.

References

Abdulkadir, A., & Zakari, M. (2013). Deployment of Ahmadu Bello University Zaria, Nigeria Institutional Digital Repository. *The Information*, 13 (1and 2), 30.

Anunobi, C. V., & Okoye, I. B. (2008). The role of academic libraries in universal access to print and electronic resources in the developing countries. *Library Philosophy and Practice*, Paper 189. http://digitalcommons.unl.edu/libphilprac/189.

Bailey, C. W., Coombs, K., Emery, J., Mitchell, A., Morris, C., Simons, S., Wright, R. (2006). Institutional Repositories. SPEC Kit 292. Washington, D.C.: Association of Research Libraries.

Bozimo, D. O. (2008). Strategic Approach to Open Access in Nigeria. International Workshops on the Open access repositories: New models for Scholarly communication. Retrieved from http://www.pressreleasepoint.com(200805)12-strateg.

Christain, G. A. (2008). Issues and challenges to the development of open access institutional repositories in academic and research institutions in Nigeria. A Research paper prepared for the International Development Research Centre (IDRC), Ottawa, Canada.

Crow, R. (2002). *The case for institutional repositories: A SPARC Position Paper*. Retrieved from http://www.arl.org.sparc/IR/ir.html.

Dabholkar, R., Prabakaran, R., & Kurahatti, B. T. (2008). Building an institutional repository: A TIFR initiative. *Bulletin of the American Society for Information Science and Technology*, *35*(4), 34–45.

Debachere, M. C. (1995). Problems in obtaining grey literature. *IFLA Journal*, *21*(2), 94–98.

Dhanavandan, S., & Tamizhchelvan, M. (2015). A study on recent trends and growth of institutional repositories in South Asian countries. *International Journal of Information Library and Society*, *5*(1), 33. 15.

Dhanavandan, S. A., & Tamizhchelvan, M. (2015). Institutional repositories in BRICS countries: A study. *International Journal of Knowledge Content Development and Technology*, *5*(1), 33–47. 33

Directory of Open Access Repository (OpenDOAR). (2014). Retrieved from www.lib.vt.edu

Egwunyenga, E. J. (2008). Dystrophies and Associated Crisis in Research and Academic Publication in Nigerian Universities. *Anthropologist*, *10*(4), 245–250.

Eke, H. N.. (2011). Digitizing resources for University of Nigeria repository: Process and Challenges. Webology, 8(1).

Earwage, A. S. (2008). Institutional repositories: benefits and challenges for libraries. Retrieved February 26, 2012 from http://infosherpas.com/ojs/index.php/openandlibraries/article/view/5/9.

Federal Ministry of Education. (2000). The state of education in Nigeria. UNESCO Abuja Office.

Herbert, V. de S. (2002). The OAI and a disaggregated system for Scholarly Communication. Keynote at the Ethical

Forum on Scholarly Communication, University Foundation, Brussels, Belgium, October 20 2002.

Jackson. (2011). Societal transformations for a sustainable economy. A United Nations Sustainable Development Journal. Available at https://onlinelibrary.wiley.com/doi/full/10.1111/j.1477-8947.2011.01395.x.

Jones, R., Andrew, T., & MacColl, J. (2006). *The Institutional Repository*. Oxford: Chandos Publishing.

Li, Y., & Banach, M. (2011). Institutional repositories and digital preservation: assessing current practices at research libraries. *D-Lib Magazine*, *17*(5/6). Retrieved from http://www.dlib.org/dlib/may11/yuanli/05yuanli.html

Lynch, C. A., & Lippincott, J. K. (2005). Institutional repository deployment in the United States as of early 2005. *D-Lib Magazine*, *11*(09), 31–39.

National Universities Commission (NUC). (2016). Retrieved January 5, 2016 from http://www.nuc.edu.ng/pages/universities.asp.

National Universities Commission (NUC). (2017). Retrieved January 5, 2016 from http://www.nuc.edu.ng/pages/universities.asp.

Nkiko, C., Bolu, C., & Michaei, O. H. (n.d.). Managing a sustainable institutional repository: the Covenant University experience. Retrieved from http://eprints.covenantuniversity.edu.ng/5190/1/Happiness%204.pdf.

Nwokedi, V. C. (2011). Nigerian university academics and institutional repository: A case study of University of Jos, Faculty of Natural Sciences Lecturers. *Information Technologist (the))*, *7*(2), 137–146.

Okojie V. (2008). Strategic approach to open access in Nigeria. An international workshop on open access repositories: New models for scholarly communication. Retrieved on 10 04/2010 from http://www.pressrelease-point.com(200805)12-strateg.

Okoroma, F. N. (2011). Towards effective management of grey literature for higher education, research and national development. *Library Review*, *60*(9), 789–802.

Onyancha, I., Al-Awah, A., & Cole, F. (2012). Addressing institutional potential loss of records and knowledge in Africa: The case of the ECA institutional repository – A knowledge base on African socio-economic development. *The International Information & Library Review*, *44*, 177–179.

Teper, T. H., & Beth, K. (2002). Long-term retention of electronic theses and dissertations. *College & Research Libraries*, *63* (1), 61–72.

Utulu, S. C. A., & Bolarinwa, O. (2009). Open access initiatives adoption by Nigerian academics. *Library Review*, *58*(9), 660– 669.

Velterop, J. (2004). Submission to the house of commons science and technology committee's inquiry into scientific publications. Retrieved from http://www.biomedcentral.com/openaccess/inquiry/bmcsubmission.pdf.