

Facilitating conditions and institutional repository sustainability by librarians in public university libraries in Nigeria

Sustainability
by librarians

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Abstract

Purpose – This study aims to investigate the facilitating conditions (FCs) and how these FC affect institutional repository (IR) sustainability practices in public universities in Nigeria.

Design/methodology/approach – A survey research design was adopted in this study. The study population comprised 542 librarians from public universities that have IRs across Nigeria. A sample size of 230 librarians was determined using Taro Yamane's formula. A multi-stage sampling technique was used to select the respondents in three stages, which were purposive, stratified and purposive sampling. A structured, validated questionnaire was used for data collection. Data were analyzed using descriptive and inferential (simple and multiple regression) statistics at a 5% level of significance.

Findings – The result revealed that the availability of FCs ($\beta = 0.459$, $t(211) = 7.719$, $p = 0.000$) has a positive and significant influence on IR sustainability in public university libraries in Nigeria. The F -test (1, 223) value of 59.582 shows that there is sufficient evidence to substantiate the model's usefulness in explaining IR sustainability. The R^2 (0.211) indicates that 21.1% of the variation in IR sustainability is explained by the availability of FCs in public university libraries in Nigeria. The finding suggests that the availability of FCs is a vital predictor of IR sustainability in public university libraries in Nigeria. The result also depicts that out of the eight parameters that measure the availability of FCs, it was current awareness of IR that had a positive and significant influence on IR sustainability.

Originality/value – This study concluded that ICT skills and FCs are contributory factors to IR sustainability practices by librarians in public university libraries in Nigeria. It was recommended that university administrators formulate policies that promote the sustainability of IR and provide adequate funds to support IR sustainability. Furthermore, the library management in public university libraries in Nigeria should drive content recruitment and create awareness of the IRs among students and faculty to ensure continued use.

Keywords Academic librarians, Facilitating conditions, ICT skills, Institutional repository sustainability practices, Public university libraries

Paper type Research paper

1. Introduction

Institutional repository sustainability (IRS) is an all-encompassing construct that revolves around the continuity of institutional repository (IR). Institutional repositories are concerned with the task of providing security to the intellectual contents of a university, while sustainability implies the continuous or consistent operation of an entity. The IRS is therefore concerned with



the continuous operation of an IR. When IRs are sustained, the quest of the university to advance studying, learning and research may be attained. According to [Nkiko *et al.* \(2015\)](#), IR sustainability requires concerted efforts, the collective participation of stakeholders and a clear definition of roles and responsibilities. Hence, critical components germane to IRS are metadata management, content recruitment, storage, preservation and archiving, copyright adherence and the discoverability of IR ([Dlamini and Snyman, 2019](#)).

IRS is an issue of concern in Nigeria, as many university repositories do not have the necessary resources, as are obtainable in most repositories in developed countries. [Akintunde and Anjo \(2012\)](#) noted that IT technical staff is very scarce with regard to supporting IR setup and sustainability in Nigeria. [Okoroma and Abioye \(2017\)](#) posited that setting up and sustaining IRs in many universities in Nigeria have been a difficult task, whereas a lot of other university libraries in most developed countries have successfully set up and sustained theirs because of readily available human and material resources. [Ukwoma and Ngulube \(2019\)](#) identified some obstacles to the utilisation and sustainability of IR in academic libraries in Nigeria and found that the IR of many universities lacks global accessibility, has poor copyright structure for contents and that several members of the academic community do not have proper awareness about IR in their university. [Eke \(2012\)](#) argued that several efforts have been made towards setting up IRs in some universities in Nigeria, but some gaps exist in this quest.

Corroborating this assertion, [Fagbohun *et al.* \(2018\)](#) submitted that IR sustainability is yet to be achieved in Nigeria because of a lack of requisite organisational and technical infrastructures such as policies, copyright and ownership issues, awareness and advocacy, computer systems, laptops, software, computer networks, scanners, poor bandwidth, internet connectivity and an irregular state of electricity supply and funding. The sustainability of IRs is increasing remarkably in some developed nations and a few developing nations, such as Brazil, India and South Africa ([Obiora and Ogbomo, 2013](#)). [Nwakaego \(2018\)](#) confirmed that several institutional and external factors are impeding the sustainability of IRs in Nigerian university libraries. [Okoroma \(2019\)](#) noted that libraries in South Africa appear to be making better progress in the area of IR deployment and sustenance, while this appears to be at a very slow rate in the Nigerian context because of some challenges.

Facilitating conditions (FCs) is a construct in the unified theory of acceptance and use of technology (UTAUT) developed by [Venkatesh *et al.* \(2003\)](#). The theory was established on four theoretical constructs representing determinants of intention to use behaviour, which play surrogates of technology acceptance ([Ahmad, 2015](#)). The constructs are performance expectancy, effort expectancy, social influence and FCs. FCs, according to [Venkatesh *et al.* \(2003\)](#), can be defined as “the degree to which an individual believes that an organisational and technical infrastructure exists to support use of a system” (p. 23). This has been found to impact actual usage of technology rather than behavioural intention in technology adoption studies ([Venkatesh *et al.*, 2003](#)) and open access adoption research ([Dulle and Minishi-Majanja, 2011](#)). According to [Dwivedi *et al.* \(2011\)](#), in their meta-analysis of findings, it was reported that 43 published studies on FCs had major effects on both behavioural intention as well as usage of systems or technology. Because FCs are about organisational and technical support to aid the use of a system, this study defines FCs as technical, financial, physical and material resources that foster performance and IRS. The FCs include funding, ICT infrastructure (hardware and software), internet connectivity, collection development policy, training, power supply, physical facilities, advocacy and a current awareness programme.

FCs have appeared in studies as factors that determine technology acceptance and usage (Kim, 2011; Dulle, 2010; Ahmad, 2015). IR is such a good example of a technology whose acceptance and management may depend on the level of available FCs. For instance, the availability of ICT infrastructure in the form of computer software and hardware (computer systems, printers, scanners, cameras, keyboards, CDROMs, Diskettes, hard disks, flash drives and memory cards) is indispensable when setting up any ICT-based facility. This is because the functionality and performance of the system or technology depend on the software and hardware installed. As such, IR cannot exist without software and hardware components. In line with this, Nkiko *et al.* (2015) were of the opinion that basic technological facilities remain largely on which institutional repositories revolve; however, requirements may depend on the size and nature of the repository.

Akintunde (2010a, 2010b) highlighted some ICT infrastructure needed for effective IR sustainability. The infrastructure includes computer systems, computer networks, computer software, satellite resources, printers, scanners, telecommunication facilities, electronic photocopiers, laptops, adequate bandwidth size and internet connectivity. There is also a need for cameras, CDROMs, video recording devices, audio recording devices, harddisks, digital pens, flash drives and local area networks. The availability of these ICT infrastructures is essential to the development and sustainability of IRs. The facilities may determine how flexible and effective sorting, digitisation, uploading and storage of digital information resources in the repository will be carried out. Unfortunately, many African academic institutions and Nigeria in particular seem to be lagging when it comes to the availability of ICT infrastructure for their repository. The reason for the slow pace of the development of IRs, as reported in many studies, is not far-fetched, as digital repositories cannot effectively exist without ICT infrastructure.

Okoro and Okogwu (2018) decried the poor state of many IRs in Nigeria owing to the lack or non-availability of basic and advanced ICT infrastructure, such as internet broadband for connectivity. Internet connectivity is a major need for the repository in the performance of its statutory responsibilities. The visibility and usability of an IR may also be influenced by the quality and availability of its internet connectivity. Internet connectivity may foster software implementation, management and sustainable storage of repository collections. In the same vein, repository users could find it easy and flexible to retrieve information from the repository when it is fully connected to the internet. Meanwhile, these objectives may not be achieved if the repository does not have functional internet connectivity. Okoroma (2019) reported that infrastructural deficits such as low bandwidth, insufficient and obsolete hardware and software components, together with low server configuration and erratic power supply induced by poor funding, are among the infrastructural issues impeding the sustainability of IRs in university libraries in Nigeria. Sharma *et al.* (2009) opined that librarians need a good knowledge of the software, hardware, networking and standards required to design repositories and support the long-term preservation and sustainability of scholarly records. To sustain IRs, competencies beyond the conventional skills attained from library schools are required (Gbaje *et al.*, 2018).

FCs are conceived in the form of the availability of resources to facilitate the use of a system. In the implementation, use and management of IRs, availability of power supplies is a major resource that may facilitate sustainability. Once the software, hardware and internet connectivity have been sorted out, electricity is required to power these components and other repository facilities. Electricity is also the principal factor in the digitisation of information materials, content uploading, software upgrades and the maintenance of the repository server on the internet from breaking down. Importantly, patrons may not be able to retrieve information from the repository if electricity is not always available because

repository functions majorly on electronic systems. In a previous study, [Dulle and Minishi-Majanja \(2011\)](#) found that FCs were a factor influencing Tanzanian researchers' use of open-access materials.

According to the UTAUT model, it is expected that FCs are a significant key determinant of individual usage behaviour with regard to IRs. Meanwhile, IRs are viewed as digital archives where scholarly materials created by members of a university are preserved for sustainable use by in-house and external patrons. Considering these objectives, organisational support in the form of the provision of physical facilities such as chairs, tables, air conditioning systems and fire extinguishers may influence the work environment and consequently the job performance of the staff. While a conducive work environment may contribute to IR sustainability, poor working conditions, on the other hand, may have a negative impact on IR sustainability. However, the availability of physical facilities that make up the work environment as well as the propensity for power supply, internet connectivity and ICT infrastructure may depend largely on the financial strength of the host institution.

IRs are money-gulping projects whose implementation, maintenance and sustainability may depend on finance. Many universities in Nigeria seem not to have been able to set up IR because of financial paucity, while existing repositories have not been able to match up with their counterparts in developed climes because of poor funding. According to the National Bureau of Statistics (2019), Nigeria's budget for education has remained at less than 10% for the past ten years. Out of this 10%, only a meagre sum goes to the development of libraries and repositories ([Nigeria University Commission, 2020](#)); hence, the slow pace of repositories in Nigeria. There is a high tendency for development and improved performance when adequate finance is made available for the development of IRs in Nigeria. But beyond funding, an important issue that may foster or limit IR sustainability is the training of repository personnel. How knowledgeable and competent repository personnel are may determine how well they will be able to support the growth and continuity of IR.

[Anyaegbu and Wali \(2019\)](#), in their study, which focused on the influence of staff training on the performance of libraries in South-South Nigeria, found a positive relationship between staff training and the performance of libraries. IR sustainability is a task that may be affected by repository staff competence. Metadata management, content recruitment, digitisation, digital preservation and interoperability, copyright adherence and discoverability of IR, which are synonymous with sustainability, may be achieved when repository staff competence is well equipped with knowledge and dexterity to perform these tasks, and this may invariably contribute to IR sustainability. On the contrary, a lack of training opportunities to enhance the knowledge and skills of repository managers as relating to their tasks may result in the failure or breaking down of the IR, as the case may be.

Studies have been carried out in Nigeria and elsewhere to understand factors influencing intuitional repository sustainability ([Onwubiko, 2020](#); [Martin-Yeboah et al., 2020](#); [Ejikeme and Ezema, 2020](#); [Ukwoma et al., 2019](#); [Gbaje and Mohammed, 2017](#); [Ukwoma and Dike, 2017](#)). In these studies, FCs have emerged as factors influencing IR sustainability. For instance, [Ukwoma and Dike \(2017\)](#) reported a low level of use of IRs among contributors and patrons in Nigeria because of a lack of awareness. Awareness is informing people about the availability of a thing. Awareness has been found to be a major determinant of use ([Oriogu et al., 2018](#)). If something exists and users are not aware of it, adoption and use of such things may be low. In the context of IRs, it is possible for students, lecturers, scholars and researchers not to submit their contents to IRs if they are not aware of such an information service.

Similarly, patrons may not visit the repository online or onsite if they do not have knowledge of its existence and the services it provides. The availability of advocacy support that will address the full range of stakeholders to create a broad culture of engagement within and beyond the institution, publicise repository developments via institutional newsletters, seminars, email alerts, etc. and provide publicity materials for use within and outside the institution may greatly influence IR sustainability. There is a tendency for increased use and consistent development of IR when the stakeholders are properly informed and empowered to use IR.

In the UK, [Betts-Gray and Harrington \(2010\)](#) reported that many higher education institutions have opted to increase their repository collection with a combination of metadata-only records and full-text publications through a variety of advocacy programmes. Some of the advocacy strategies identified by the authors include community building or the face-to-face approach, which is aimed at building partnerships to develop sustainable solutions; the involvement of university IT and school-based IT staff to address workload and workflow issues; and empowering important library staff colleagues to keep them informed about internal and external developments to enable them to become effective advocates. Other strategies of advocacy capable of increasing awareness of IR include liaison with publication database stakeholders, liaison with departmental administrators and liaison with research scholars, among others.

A corollary of ICT skills is the availability of FCs for the crystallisation and sustainability of IRs. The combination of these two variables is a veritable factor in the survival and sustainability of IRs. It is against this background that this study investigated how the independent variables of ICT skills and FCs affect IRS in selected universities in Nigeria.

1.1 Statement of the problem

According to the National University Commission (NUC, 2022), Nigeria has the largest concentration of tertiary institutions in Africa, with an estimation of 221 universities and over 100 research and related establishments. In spite of the huge concentration of tertiary institutions in Nigeria, the number of IRs available in the country is not impressive. A report by the Directory of Open Access Repositories ([OpenDOAR, 2021](#)) shows that there are only 31 active and functional IRs out of the 220 universities in Nigeria, compared to other countries such as South Africa and Kenya. The implications of this lacuna are limited access to research and underdevelopment, limited visibility for the researchers and the universities, overdependence on commercial publishers and missed opportunity for open access research development ([Adekunle and Fagbohun, 2019](#); [Olorunsola and Machingambi, 2017](#)). In today's digital world, IRs are very essential for the development, visibility and dissemination of research outputs. However, IR sustainability has appeared in many studies as a crucial factor that determines whether IRs' benefits will be optimised or not ([Goldberg, 2012](#); [Coetzee and Fourie, 2019](#)). [Nwakima and Onyango \(2019\)](#), in their study, found that IR sustainability is a critical factor in ensuring the long-term preservation and accessibility of research outputs.

Irrespective of the accrued potential benefits linked to IRs by university libraries, it has been observed that most university libraries in Nigeria are facing a serious issue with sustainability. There are several factors that contribute to the problem of IR sustainability in Nigeria. These include lack of funding, lack of institutional support, technical challenges, as well as low awareness and use of IRs. [Adedokun-Shittu and Afolabi \(2017\)](#) reported in their study that most university IRs have not attained international standards because of limited funding, low awareness and use of IRs and various other technical challenges.

FCs have also been linked with the sustainability of any system (Loorbach *et al.*, 2013). Defined as conditions that enable sustainable practices and sustainable outcomes, FCs in the form of funding, training, leadership, awareness and advocacy and exposure to copyright and ownership issues may affect IRS. However, observations from existing findings revealed inadequate FCs for IRS in Nigeria. For instance, Ilo and Okoye (2017) found that a lack of institutional support and funding, inadequate technical expertise and limited awareness and understanding of the importance of IRs as challenges to IR sustainability in Nigeria. In the same vein, poor funding of IRs, low levels of content and usage and poor technical support have been discovered as major hindrances to IR sustainability in Nigeria (Oyewumi and Oyewole, 2018; Adebilero-Iwari and Akande, 2020).

IRS is important to enhance research development and the visibility of researchers and universities and this is why empirical investigation of variables that could influence IR sustainability becomes important. To this end, several studies have been carried out in the area of repository establishment, accessibility and utilisation; there is still a dearth of literature and empirical research on the nexus between ICT skills, FCs and IRS in Nigeria, to the best of the authors' knowledge. Hence, the thrust of this study was to fill this vacuum by investigating the ICT skills of librarians, FCs and IRS in public university libraries in Nigeria.

1.2 Objective of the study

The main objective of this study was to investigate how the ICT skills of librarians and FCs can influence IRS in public university libraries. The specific objectives are to:

- find out IRS practices in public university libraries in Nigeria;
- ascertain the FCs available to support IR sustainability in public university libraries in Nigeria;
- ascertain the influence of FCs on IRS in public university libraries in Nigeria; and
- ascertain the benefits associated with IR sustainability in public university libraries in Nigeria.

1.3 Research questions

The study was guided by the following research questions:

- RQ1.* What are the institutional repository sustainability practices in public university libraries in Nigeria?
- RQ2.* What are the facilitating conditions available to support IR sustainability in universities and public university libraries in Nigeria?
- RQ3.* What are the challenges associated with IR sustainability in public university libraries in Nigeria?
- RQ4.* What are the benefits associated with IR sustainability in public university libraries in Nigeria?

1.4 Research hypotheses

The following null and alternative hypotheses were tested in the study at the 0.05 level of significance:

- H01.* There is no significant influence of available facilitating conditions on institutional repository sustainability in public university libraries in Nigeria.

2. Methodology

The population of this study consisted of 542 professional librarians in all public university libraries in Nigeria that have IRs. The Nigerian Universities Commission lists of accredited institutions in Nigeria in December (2021) indicate that there are 220 universities, comprising 51 federal universities, 59 state universities and 111 private universities. However, public universities with IRs in Nigeria were considered for this study, which comprises 20 federal universities and 5 state universities.

While the general population for this study consisted of 542 librarians across all the public university libraries in states and federal government-funded universities in Nigeria that have IRs, Taro Yamane's (1967) formulae and table were used to determine a sample size of 230 librarians for this study. The multistage sampling technique gives a representative sample, yielding precise results that are generalisable. The multistage sampling technique used was purposive, stratified and purposive sampling.

2.1 Method of data collection

A total of 230 copies of the questionnaire were distributed to academic librarians in the public universities in Nigeria that have currently functional or previously functional IRs that are registered in OpenDOAR. The collected data were collated, coded and analysed in simple frequency counts and percentages with the aid of SPSS- Statistical Product and Service Solution 22. Descriptive statistics such as frequency, percentages, mean and standard deviation were used to analyse the research questions. The research hypotheses were subjected to regression analysis. The hypotheses were tested at the 0.05 level of significance.

3. Results and findings

3.1 Response rate

Questionnaires were distributed to respondents in the area of study and a response rate was calculated on the basis of the total number of copies of questionnaire collected. A total of 230 copies of the questionnaires were distributed to 25 Public University Librarians in Nigeria; however, 225 were duly completed and returned. This represents 97.8% of the total questionnaires distributed amongst the twenty five public university libraries selected for the study. The other five questionnaires were not returned by the respondents.

3.2 Demographic information of respondents

The demographic information of respondents is presented in [Table 1](#).

[Table 1](#) reveals the demographic information of librarians in public university libraries in Nigeria. The results showed that the highest academic qualification in public university libraries in Nigeria is a PhD degree at 64% ($n = 144$), while the least is a Bachelor's degree (2.7%, $n = 6$); years of experience show that 26% of the respondents (25.8%) who participated in the study had 11–25 years of working experience, while few had more than 30 years of working experience (8.4%). On the library designation, the results of [Table 1](#) indicate that senior librarians at 24.9% are the highest designation, while university librarians (6.7%) are the least. This finding shows that librarians in public university libraries in Nigeria are a highly educated workforce. One could deduce from this result that the majority of the respondents possessed a high level of education, which could facilitate IRS in public university libraries in Nigeria:

RQ1. What are the institutional repository sustainability practices in public university libraries in Nigeria?

DLP

Demographic information of librarians	Frequency	%
<i>Highest academic qualification</i>		
Bachelor degree	6	2.7
Masters	75	33.3
PhD	144	64.0
Total	225	100.0
<i>Years of work experience</i>		
0–5 years	22	9.8
6–10 years	44	19.6
11–15 years	58	25.8
16–20 years	26	11.6
21–25 years	33	14.7
26–30 years	23	10.2
31 years and above	19	8.4
Total	225	100.0
<i>Designation</i>		
Assistant Librarian	9	4.0
Librarian I	41	18.2
Librarian II	28	12.4
Senior Librarian	56	24.9
Principal Librarian	36	16.0
Deputy Librarian	40	17.8
University Librarian	15	6.7
Total	225	100.0

Table 1.
Demographic
information of
librarians

Source: Table by the authors (2023)

The result of [Table 2](#) shows that public university libraries adopt various practices to ensure the sustainability of their IRs. This is because of the value of the overall mean (2.98), which falls within the “Agree” range in the decision criteria. IRS practices were operationalised using copyright adherence, discoverability, metadata management, content recruitment, preservation, archiving and interoperability. The finding revealed that metadata management had an average mean score of $\bar{x} = 3.06$, $SD = 0.83$; for discoverability sub-scale, with an average mean of $\bar{x} = 2.97$, $SD = 0.78$; copyright adherence sub-scale attracted an average mean score of $\bar{x} = 2.97$, $SD = 0.84$; content recruitment sub-scale shows a similar trend with an average mean score of $\bar{x} = 2.97$, $SD = 0.84$; additional analyses revealed a similar trend for preservation, archiving and interoperability sub-scale with an average mean of $\bar{x} = 2.94$, $SD = 0.85$. Considering the findings from these analyses, this finding signifies that public university libraries in Nigeria ensure the sustainability of their IRs through various practices such as metadata management, discoverability, copyright adherence, content recruitment and preservation, archiving and interoperability:

RQ1. RQ2. What are the facilitating conditions available to support IR sustainability in universities and public university libraries in Nigeria?

[Table 3](#) presents the results of descriptive statistics for the availability of FCs to support IR sustainability. From the result, it was observed that several kinds of FCs are available to support IR sustainability in universities and public university libraries in Nigeria (overall mean = 2.75, on a scale of 4). FCs were measured with technical infrastructure, intellectual

Institutional repository sustainability	SA (%)	A (%)	D (%)	SD (%)	Mean \bar{x}	SD
<i>Metadata management, $\bar{x} = 3.06, SD = 0.83$</i>						
The institution ensures an accurate description of the digital object itself (descriptive metadata)	93 (41.3)	89 (39.6)	24 (10.7)	19 (8.4)	3.14	0.92
The institution ensures strict adherence to the criteria for selecting metadata schemata	84 (37.3)	91 (40.4)	32 (14.2)	18 (8.0)	3.07	0.91
The institution ensures strict compliance and monitoring of metadata quality on an ongoing basis	68 (30.2)	105 (46.7)	28 (12.4)	24 (10.7)	2.96	0.93
<i>Discoverability, $\bar{x} = 2.97, SD = 0.78$</i>						
The institution assures contributors that submitted contents are accessible globally	80 (35.6)	102 (45.3)	32 (14.2)	11 (4.9)	3.11	0.83
The IR website is built using standard markup languages that are easily understood by search engines	76 (33.8)	100 (44.4)	35 (15.6)	14 (6.2)	3.05	0.86
The University Library ensures timely uploading of published/submitted contents in the IR for easy access over the internet	55 (24.4)	91 (40.4)	47 (20.9)	32 (14.2)	2.76	0.98
<i>Copyright adherence, $\bar{x} = 2.97, SD = 0.77$</i>						
The University Library strictly adheres to the rule of copyright laws while providing storage and dissemination of information	60 (35.6)	106 (47.1)	18 (8.0)	21 (9.3)	3.09	0.90
The institution's IR has implementation of clear intellectual and copyright regulations	71 (31.6)	95 (42.2)	48 (21.3)	11 (4.9)	3.00	0.85
The institution constantly collaborates with publishers for copyright permission to deposit published materials into the IR in the institution	64 (28.4)	80 (35.6)	58 (25.8)	23 (10.2)	2.82	0.96
<i>Content recruitment, $\bar{x} = 2.97, SD = 0.84$</i>						
There are institutional guidelines on content recruitment for the IR to ensure consistent standard practice	81 (36.0)	83 (36.9)	48 (21.3)	13 (5.8)	3.03	0.90
University community members are informed of the services of the IR	82 (36.4)	81 (36.0)	34 (15.1)	28 (12.4)	2.96	1.01
There is constant awareness creation on the need to voluntarily deposit scholarly contents in the IR	73 (32.4)	93 (41.3)	27 (12.0)	32 (14.2)	2.92	1.01
<i>Preservation, archiving and interoperability, $\bar{x} = 2.94, SD = 0.85$</i>						
There is a preservation method in place in the library	83 (36.9)	88 (39.1)	29 (12.9)	25 (11.1)	3.02	0.97
The university library offers digitised contents in suitable formats for long-term and short-term preservation	74 (32.9)	89 (39.6)	31 (13.8)	31 (13.8)	2.92	1.01
There is access to digital resources by applying the Open Archives Initiative Protocol (OAI) to the institution	69 (30.7)	92 (40.9)	31 (13.8)	33 (14.7)	2.88	1.01
<i>Overall mean</i>					2.98	0.71

Table 2.
Descriptive statistics
for institutional
repository
sustainability
practices

Notes: Decision rule: If mean is 1–1.74 = SD; 1.75–2.49 = D; 2.50–3.24 = A; 3.25–4.0 = SA. Criteria mean = 2.5. SA = strongly agree; A = agree; D = disagree; SD = strongly disagree; M = mean; SD = standard deviation

Source: Table by the authors (2023)

Availability of facilitating conditions	SA (%)	A (%)	D (%)	SD (%)	Mean	
					\bar{x}	SD
<i>Human resources, $\bar{x} = 3.08$, $SD = 0.74$</i>						
There is availability of competent manpower in the library	96 (42.7)	96 (42.7)	25 (11.1)	08 (3.6)	3.24	0.78
Adequate manpower is available in the library	62 (27.6)	96 (42.7)	53 (23.6)	14 (6.2)	2.92	0.86
<i>Current awareness of IR, $\bar{x} = 2.93$, $SD = 0.74$</i>						
Staff are encouraged to willingly deposit their articles with the IR	88 (39.1)	107 (47.6)	15 (6.7)	15 (6.7)	3.19	0.83
Staff are encouraged to make use of IR for the preservation of scholarly materials	70 (31.1)	112 (49.8)	23 (10.2)	20 (8.9)	3.03	0.87
Staff are educated on self-archiving methods	36 (16.0)	83 (36.9)	82 (36.4)	24 (10.7)	2.58	0.88
<i>Intellectual property/copyright, $\bar{x} = 2.89$, $SD = 0.76$</i>						
There is strategic plan to adhere to copyright law in my institution	63 (28.0)	100 (44.4)	44 (19.6)	18 (8.0)	2.93	0.89
IR content pass through plagiarism process before upload	86 (38.2)	58 (25.8)	56 (24.9)	25 (11.1)	2.91	1.03
There is a strategic plan to protect staff intellectual property in the institution	57 (25.3)	92 (40.9)	57 (25.3)	19 (8.4)	2.83	0.90
<i>Technical infrastructure, $\bar{x} = 2.86$, $SD = 0.50$</i>						
<i>Hardware $\bar{x} = 3.32$, $SD = 0.62$</i>						
Availability of computer systems	170 (75.6)	41 (18.2)	10 (4.4)	04 (1.8)	3.68	0.64
Availability of scanners and digitisers	111 (49.3)	81 (36.0)	29 (12.9)	04 (1.8)	3.33	0.76
Availability of backup system (e.g. hard disks)	116 (51.6)	72 (32.0)	27 (12.0)	10 (4.4)	3.31	0.85
Availability of alternation source of power (e.g. inverter)	103 (45.8)	94 (41.8)	21 (9.3)	07 (3.1)	3.30	0.76
Availability of strong internet bandwidth	92 (40.9)	91 (40.4)	35 (15.6)	07 (3.1)	3.19	0.80
Availability of strong anti-virus	111 (49.3)	42 (18.7)	57 (25.3)	15 (6.7)	3.11	1.00
<i>Software, $\bar{x} = 2.40$, $SD = 0.67$</i>						
DSpace	130 (57.8)	37 (16.4)	45 (20.0)	13 (5.8)	3.26	0.97
DigitalCommons	58 (25.8)	56 (24.9)	68 (30.2)	43 (19.1)	2.57	1.07
Eprints	36 (16.0)	61 (27.1)	62 (27.6)	66 (29.3)	2.30	1.05
Fedora	13 (5.8)	47 (20.9)	84 (37.3)	81 (36.0)	1.96	0.89
Hydra	13 (5.8)	31 (13.8)	104 (46.2)	77 (34.2)	1.91	0.84
<i>Advocacy, $\bar{x} = 2.82$, $SD = 0.75$</i>						
The Institution promotes open access	87 (38.7)	85 (37.8)	35 (15.6)	18 (8.0)	3.07	0.92
The library continuously enlightens authors on the benefits of IR	59 (26.2)	84 (37.3)	64 (28.4)	18 (8.0)	2.82	0.91
There library continuously organises advocacy programmes with regard to IR	30 (13.3)	94 (41.8)	78 (34.7)	23 (10.2)	2.58	0.84
<i>Institutional policies, $\bar{x} = 2.59$, $SD = 0.85$</i>						
There is a digital preservation policy	51 (22.7)	88 (39.1)	47 (20.9)	39 (17.3)	2.67	1.01
There is a submission policy	40 (17.8)	103 (45.8)	47 (20.9)	35 (15.6)	2.66	0.94
There is a content recruitment policy	35 (15.6)	74 (32.9)	74 (32.9)	42 (18.7)	2.45	0.96
<i>Organisational support, $\bar{x} = 2.56$, $SD = 0.79$</i>						
Publication support as a yardstick for ensuring strict adherence to depositing articles into IR	52 (23.1)	69 (30.7)	73 (32.4)	31 (13.8)	2.63	0.98
There is a standardised metadata control process	33 (14.7)	82 (36.4)	88 (39.1)	22 (9.8)	2.56	0.85
All the tools needed for the sustainability of IR are available in the library	33 (14.7)	80 (35.6)	73 (32.4)	39 (17.3)	2.48	0.94

(continued)

Table 3. Descriptive statistics for facilitating conditions available to support IR sustainability

Availability of facilitating conditions	SA (%)	A (%)	D (%)	SD (%)	Mean \bar{x}	SD
<i>Funding, $\bar{x} = 2.11, SD = 0.81$</i>						
There is availability of funds for the maintenance of IR equipment in the library	29 (12.4)	50 (22.2)	105 (46.7)	42 (18.7)	2.28	0.91
Funds are made available for the purchase of IR equipment in the library	28 (12.4)	55 (24.4)	91 (40.4)	51 (22.7)	2.27	0.94
There is availability of funds for training personnel in the library	21 (9.3)	56 (24.9)	74 (32.9)	74 (32.9)	2.10	0.97
Funds are available for hiring competent IT personnel in the library	16 (7.1)	53 (23.6)	88 (39.1)	68 (30.2)	2.08	0.90
Funds are available for staff publications and research	20 (8.9)	34 (15.1)	60 (26.7)	111 (49.3)	1.84	0.98
<i>Overall mean</i>					<i>2.75</i>	<i>0.49</i>

Notes: Decision rule: If mean is 1–1.74 = SD; 1.75–2.49 = D; 2.50–3.24 = A; 3.25–4.0 = SA. Criteria mean = 2.5

Source: Table by the authors (2023)

Table 3.

property/copyright, current awareness of IR, human resources, advocacy, institutional policies, organisational support and funding.

The finding revealed that public university libraries in Nigeria had a mean score on human resources ($\bar{x} = 3.08, SD = 0.74$); current awareness of IR sub-scale, with an average mean of $\bar{x} = 2.93, SD = 0.74$; and the intellectual property/copyright subscale attracted an average mean of $\bar{x} = 2.89, SD = 0.76$; also the analysis revealed that librarians responses to technical infrastructure (hardware and software) sub-scale attracted an average mean score of $\bar{x} = 2.86, SD = 0.50$; further analyses revealed similar trend for advocacy subscale with an average mean of $\bar{x} = 2.82, SD = 0.75$; institutional policies sub-scale, with an average mean of $\bar{x} = 2.59, SD = 0.85$; and organisational support subscale attracted an average mean of $\bar{x} = 2.56, SD = 0.79$; further analyses revealed that funding had a low average mean of $\bar{x} = 2.11, SD = 0.81$.

In view of findings from these analyses, this finding signifies that in spite of significant progress in providing FCs such as human resources, current awareness of IR, intellectual property/copyright, technical infrastructure, advocacy, institutional policies, organisational support for the sustainability of IR, issues such as funding and the unavailability of IR tools have not been given serious attention by public university libraries in Nigeria.

Hypothesis: There is no significant influence of available facilitating conditions on institutional repository sustainability in public university libraries in Nigeria.

To test hypothesis, the linear regression method was adopted. The results and conclusions are explained below.

The result of Table 4 revealed that the availability of FCs ($\beta = 0.459, t(211) = 7.719, p = 0.000$) has a positive and significant influence on the sustainability of IRS in public university libraries in Nigeria. The F -test (1, 223) value of 59.582 shows that there is sufficient evidence to substantiate the model's usefulness in explaining IRS. The R^2 (0.211) indicates that 21.1% of the variation in IRS is explained by the availability of FCs in public university libraries in Nigeria. The finding suggests that the availability of FCs is a vital predictor of IRS in public university libraries in Nigeria. The regression model is presented as:

$$\text{Institutional repository sustainability} = 1.698 + 0.438 \text{ availability of facilitating conditions.}$$

DLP

This implies that institutional repository sustainability increases by 0.438 when the availability of FCs goes up by 1 index unit. Based on the *F* ratio and adjusted coefficient of determination with a *p*-value less than the conventional probability of 0.05, the null hypothesis (*H01*), which states that there is no significant influence of the availability of FCs on IRS in public university libraries in Nigeria, is hereby rejected. The finding suggests that the availability of FCs contributes positively to IRS in public university libraries in Nigeria. The study further sought to determine the influence of FCs on IRS in [Table 5](#).

The result of [Table 5](#) depicts that out of the eight parameters that measure the availability of FCs, it was current awareness of IRs (*Beta* = 0.214, *t*(215) = 3.045, *p* = 0.000) that had a positive and significant influence on IRS. Thus, creating awareness of IRs increases the chances of sustaining IRs in public university libraries in Nigeria.

Nevertheless, technical infrastructure (*Beta* = -0.075, *t*(215) = -1.195, *p* = 0.233) and organisational support (*Beta* = -0.020, *t*(215) = -0.221, *p* = 0.825) had negative but insignificant influences on IRS, while human resources (*Beta* = 0.062, *t*(216) = 0.872, *p* = 0.382), funding (*Beta* = 0.116, *t*(215) = 1.642, *p* = 0.102), institutional policies (*Beta* = 0.132, *t*(215) = 1.701, *p* = 0.090), intellectual property (*Beta* = 0.149, *t*(215) = 1.760, *p* = 0.080) and advocacy (*Beta* = 0.149, *t*(215) = 1.732, *p* = 0.085) had a positive but insignificant influences on IRS in public university libraries in Nigeria. This signifies that technical infrastructure, human resources, funding, institutional policies, intellectual property, organisational support and advocacy could not be used to predict IRS in public university libraries in Nigeria.

Table 4. Simple regression model of facilitating conditions and institutional repository sustainability

	Unstandardised coefficients		Standardised coefficients		Sig.	<i>R</i> ²	Adj. <i>R</i> ²	<i>F</i> ratio
	<i>B</i>	Std. error	Beta	<i>T</i>				
(Constant)	1.698	0.172		9.891	0.000	0.211	0.207	59.582; <i>p</i> = 0.000
Availability of facilitating conditions	0.438	0.057	0.459	7.719	0.000			

Notes: Dependent variable: institutional repository sustainability; *F*(df) = 1/223
Source: Table by the authors (2023)

Table 5. Summary of multiple linear regression analysis of facilitating conditions (dimensions) and institutional repositories sustainability

	Unstandardised coefficients		Standardised coefficients		Sig.	<i>R</i> ²	Adj. <i>R</i> ²	<i>F</i> ratio
	<i>B</i>	Std. error	Beta	<i>t</i>				
(Constant)	1.253	0.269		4.663	0.000	0.329	0.305	13.261; <i>p</i> = 0.000
Technical infrastructure	-0.105	0.088	-0.075	-1.195	0.233			
Human resources	0.059	0.068	0.062	0.876	0.382			
Funding	0.101	0.061	0.116	1.642	0.102			
Institutional policies	0.110	0.065	0.132	1.701	0.090			
Current awareness of IR	0.204	0.067	0.214	3.045	0.003			
Organisational support	-0.018	0.080	-0.020	-0.221	0.825			
Intellectual property	0.138	0.079	0.149	1.760	0.080			
Advocacy	0.140	0.081	0.149	1.732	0.085			

Notes: Dependent variable: institutional repository sustainability (IRS); *F*(df) = 8/216
Source: Table by the authors (2023)

The model's coefficient of determination value, Adj. R^2 , was found to be 0.305, indicating that 30.5% of IRS was explained by the availability of FCs (dimensions) in public university libraries in Nigeria. However, the model did not explain 69.5% of the variation in IRS, implying that there are other factors associated with IRS that were not captured in the model. Additionally, the $F(8, 216) = 13.261$, $p = 0.000$ revealed that the availability of FCs (dimensions) was considered statistically significant in predicting IRS. The predictor equation for IRS versus independent variables (FCs dimensions) is represented below. The insignificant predictors were omitted from the regression model because they had no influence on IRS:

$$\text{Institutional repository sustainability} = 1.253 + 0.204 \text{ current awareness of IR}$$

The regression coefficient of current awareness of IR is 0.204. This implies that a unit increase in current awareness of IR will lead to a 0.204 unit increase in IRs sustainability in public university libraries in Nigeria. By implication, creating awareness of IRs enhances the IRS in public university libraries in Nigeria.

4. Discussion of findings

The study investigated FCs and IRS in libraries of public universities in South-west Nigeria. A total of 230 participants were involved in the study. The study was dominated by participants with PhD qualifications. This indicates that librarians in public universities in Nigeria were highly educated and possessed the capacity to deliver excellent library services that would foster IRS of their institutions. In terms of years of experience, the majority (25.8%) had 11–15 years of work experience. The results revealed that librarians in the public universities in south-west Nigeria were highly experienced, as the majority of them had been on the job for more than 10 years.

The findings on the IRS practices in public university libraries revealed that public universities in Nigeria engage in the adoption of various IR sustainability practices. These practices include metadata management of content, discoverability of content, copyright training and adherence, consistent recruitment of content, as well as preservation, archiving and ensuring the interoperability of the content. Specifically, the result shows that the management of metadata and content on the IRs is core to the universities. The findings of this study disagree with those of [Tella and Afolabi \(2014\)](#), where it was found that the management of IR content and the use of metadata software for IR management were low among librarians.

Furthermore, the findings of this study disagree with those of [Famakinwa and Oladokun \(2019\)](#), who reported that while many repositories were actively collecting content, few had formal policies for managing that content, leading to issues with consistency and quality. This study, however, has shown that repositories in published universities in Southwest Nigeria are actually actively collecting and also using formal policies for managing the content. One of the reasons for this change might be the credence that repositories have received over the years. As the day unfolds, universities and the government at all levels are becoming more aware of the importance of IR, and the result has been more attention to the development of the repositories. Thus, priority has been given to the management of the content in many of the IRs over the years. Therefore, this study has shown to disagree with [Oyewole and Zaid \(2015\)](#) about the low implementation of content management systems in the repositories. Moreover, the findings of this study are in tandem with those of [Jewell and Versluis \(2018\)](#), who reported high levels of content management practices in various libraries across Canada.

Similarly, the study shows that IRs in Nigeria engage in activities or practices that enhance the discoverability of content published on the IR. The repositories will continue to

do this, as this is one of the ways to encourage the submission of content and maintain the relevance of the repositories. Of course, the repositories understand that the essence of IR is to enhance open access to scholarly information for research development. As such, repositories in Nigeria are making sure that content is made visible to global users. This finding is in tandem with Omitola and Omotayo (2018), who reported that many repositories were using social media and other Web-based tools to promote their content and increase discoverability. Ajiboye and Akintunde (2015) also indicate that the repository was using a variety of tools to increase discoverability, including search engine optimisation, social media and email alerts.

Unlike in the past, when library services were manually carried out, today's libraries are adopting various tools to improve their services, hence the finding of this study, which aligns with the findings of Ozigbo and Ilori (2016) that many repositories are adopting discoverability practices such as using search engine optimisation, providing RSS feeds and participating in open access initiatives to ensure the constant availability of materials.

This finding is in line with Akande and Faleye's (2018) and Bamidele and Adeyemi's (2015) findings that consistency of uploading was a priority for repository managers in Nigeria. Overall, the study finds that the extent of content adherence is high in the public university libraries in Nigeria. This finding disagrees with Idiegbeyan-ose and Adeniran's (2018) study, which discovered a low level of compliance among IRs with copyright issues. Salisu, Dahiru and Zaria (2020) also reported low compliance with copyright adherence in Nigerian institutional repositories, making their finding different from what was obtained in this study. The result might be hinged on the fact that repositories and universities are getting to understand the importance of complying with copyright agreements signed by authors, thereby ensuring that there is no bridge of agreement when uploading the content into the IR. This study also discovered a high level of content recruitment practices among IRs in Nigerian public universities. This result disagrees with Ezeala and Atubo (2020), who reported low levels of content recruitment practices among Nigerian university repositories. This study has also proved that content recruitment is a priority for IRs in Nigeria, as opposed to the findings of Omopupa's (2021) and Adetoro and Salawu (2021), which reported low levels of content recruitment practices. This is expected because universities, librarians and governments are discovering the benefits of repositories and the role they perform in research, visibility and optimum gains for the universities at large.

The study also revealed that the IRs of many public universities in Nigeria have adequate and competent manpower, and the stakeholders of these IRs. An awareness platform for the promotion of IRs was provided, opportunities to know more about copyright law were given and other organisational supports in the form of infrastructure, working resources, training and leadership were provided. However, funding was not adequately available for the librarians to work with. This finding supports [Nwakaego \(2018\)](#), who found a lack of adequate funding for IRs. However, the finding disagrees with [Oguz and Assefa \(2015\)](#), who averred that the facilitating condition in the form of awareness of IRs among the faculty members was low. Similarly, the finding supports [Saulus *et al.* \(2018\)](#) that equipment to support the use of the IRs were available to faculty members in Nigerian universities in their study that investigated technology acceptance factors in the use of IRs among faculty members in Nigerian universities.

[Rowlands and Nicholas \(2012\)](#) found that lecturers in universities demonstrated a high level of use of open-access repositories. [Ammarukleart \(2018\)](#) found that FCs predict IRS. This was also supported by [Dulle \(2010\)](#) and [Dulle and Minishi-Majanja \(2011\)](#), where FCs were found to significantly affect researchers' actual usage of open access in Tanzania. [Dwivedi *et al.* \(2017\)](#) showed that FCs enhanced the performance of libraries. [Varadaraju](#)

(2017) discovered that FCs improve the use and management of libraries *vis-a-vis* repositories. Orji, Cetin and Ozkan (2010) maintained that FCs are crucial to the use of e-resources.

The study of Bankole and Babalola (2012) attested to the fact that the availability of FCs facilitated the use and efficiency of repositories. Also, the analysis revealed that librarians' responses to the technical infrastructure (hardware and software) sub-scale attracted a weighted mean score of $\bar{x} = 2.86$, $SD = 0.50$, with most of its items falling below the weighted mean. Items such as "availability of computer systems" polled a very high mean score of $\bar{x} = 3.68$, while items such as "availability of scanners and digitisers ($\bar{x} = 3.31$)", "availability of backup system ($\bar{x} = 3.31$)", "availability of alternation source of power ($\bar{x} = 3.30$)", "availability of strong internet bandwidth $\bar{x} = 3.19$ ", "availability of strong anti-virus ($\bar{x} = 3.11$)", "Dspace ($\bar{x} = 3.26$)" and "Digital Commons ($\bar{x} = 2.57$)" had high mean scores. Items such as "Eprints ($\bar{x} = 2.30$)", "Fedora ($\bar{x} = 1.96$)" and "Hydra ($\bar{x} = 1.91$)" attracted the lowest mean scores under the subscale. By implication, computer systems are highly available to a very high extent, while software tools such as Eprints, Fedora and Hydra are less available in public university libraries in Nigeria.

Likewise, the organisational support subscale attracted a weighted mean, with some of the research items following the trend. This means that publication support is considered a yardstick for ensuring strict adherence to depositing articles into IR. There is also the availability of a standardised metadata control process, while some of the tools needed for the sustainability of IR are considered unavailable. Further analyses revealed that funding had a low weighted mean, with all of the research items following a similar trend. This signifies that funds are unavailable for the maintenance of IR equipment; the purchase of IR equipment; training of personnel; hiring of competent IT personnel and staff; and publications and research in public university libraries in Nigeria.

Furthermore, findings from the test of hypotheses showed that the availability of FCs has a positive and significant influence on IRS in public university libraries in Nigeria. The study discovered that out of all the factors, it was current awareness of IRs that had a positive and significant influence on IRS. Thus, creating awareness of IRs increases the chances of sustaining IRs in public university libraries in Nigeria. Nevertheless, technical infrastructure and organisational support have negative but insignificant influences on IRS, while human resources, funding institutional policies, intellectual property and advocacy have positive but insignificant influences on IRS in public university libraries in Nigeria.

This signifies that technical infrastructure, human resources, funding, institutional policies, intellectual property, organisational support and advocacy could not be used to predict IRS in public university libraries in Nigeria. This finding supports Dulle (2010) and Dulle and Minishi-Majanja (2011), where FCs were found to significantly affect researchers' actual usage and IR sustainability in Tanzanian universities. On the other hand, technical infrastructure had a negative and insignificant influence on IR sustainability, while human resources, funding, policy and intellectual property had positive but insignificant influences on IR sustainability. The finding that technical infrastructure had a negative and insignificant influence on IR sustainability is in tandem with that of Ammarukleart (2018), who had a similar finding.

5. Conclusion and recommendations

In conclusion, FCs are important predictors of IR sustainability. The importance of FCs in IR sustainability cannot be overemphasised. The study finds that a high level of awareness, strategic plans and policy and computer systems were available to work with for the librarians, which resulted in IR sustainability. However, software tools such as Eprints,

Fedora and Hydra as well as funding were unavailable in most of the public university libraries in Nigeria. This has implications for IR sustainability because sustainability may not be achieved if this lacuna persists. Thus, FCs in the form of technical support, training, funding, facilities, incentives, policy, advocacy, awareness and IR tools are vital to IR sustainability. Hence, FCs must be made available to achieve IR sustainability. Management should not be consumed with the impetus of having a repository alone all efforts and platforms must be put in place to ensure that librarians are provided with the right ICT skills required for an effective IR project. In the same vein, all aspects of FCs must be considered for IR sustainability to be achieved.

Based on the findings of this study, the following recommendations were made:

- There is an urgent need to support IRs in Nigerian universities with funding to enhance sustainability, as many of them are currently underfunded. Government and university management must show commitment to this by devoting a significant portion of the educational budget to the development of IRs. This will help in sustaining existing IRs and equipping them and new ones with quality resources that will facilitate scholarship and national development.
- FCs such as infrastructure, training, advocacy, intellectual property, policy and working tools such as software, computers, chairs, storage, server, internet, electricity and space in the university repositories are not encouraging; hence, attention and effort should be given to this by the government and university management.
- In today's business world, monitoring and evaluation are important for success; hence, the government should set up an effective monitoring and evaluation team that will monitor and evaluate how funds and resources disbursed into IRs are used.

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