

## STRATEGIES FOR RESEARCH DATA MANAGEMENT IN FEDERAL UNIVERSITY LIBRARIES IN NORTHWEST GEOPOLITICAL ZONE, NIGERIA.

By

DAVID Ojo Emmanuel and Dr Kabiru Dahiru Abbas

### Abstract

*This study investigated management strategies applied to research data in Federal University Libraries in Northwest zone, Nigeria. The objective of the study was to identify management strategies applied by the libraries to research data in the Universities, in terms of data generation, data organization, data storage, and data dissemination. The study was based on the interpretivists' paradigm and applied qualitative approach that was backed up with narrative research design. The population of the study consisted of the three university libraries using three HODs of research and document units, and University librarians as respondents. Structured interview and document analysis were used as data collection instruments. The study found that policy advocacy, donation/gift, purchase/subscription, appeal to faculties, fellowship among others are the common management strategies applied to research data generation; while repositories, portable storage devices, computers etc. are used for research data organisation and storage; while library/university websites, email, portable storage devices, web 2.0, radio stations among others are basically in use for research data dissemination. The study therefore concludes that libraries should continue to support universities' efforts to manage their knowledge assets through constant updates to suitable technological platforms. Also more attention should be given to building reliable and sustainable institutional repositories. Finally, the study contributes to policy, practice, society and theory.*

**Keywords:** Research data, Data management, Management strategies, University libraries, Northwest Nigeria.

### Introduction

Research is one of the trifocal responsibilities of university education and is so critical that it determines the quality of any university system and for recognition both within and outside the country. Due to the importance, research work as it were, has remained a mandatory requirement for graduation of students at first degree, Master's degree and Doctorate degree, and also constitutes a key criterion for the promotion of academic staff; and as such requires high level participation and quality work (Darlington, 2011). Indeed, it is also among the six objective indicators for ranking world universities, which are number of highly cited researches, number of articles published in nature and science, number of articles indexed in science citation index and in social sciences index (Obannaya, 2010). Hence, the need to have an effective Research Data Management system cannot be overstressed especially in a developing nation like Nigeria with the enormous challenge of growing literature generated from different programmes in the universities. Universities are increasingly becoming a repository of these knowledge and more and more researches are on the rise in different formats (digital and conventional). Several authors have described these contents among them is the recent and emerging concept – Research Data. Research data is the output of systematic research that involves the process of observing,

experimenting, and testing hypothesis (Pryor, 2012 quoted from Koltay, 2015). Research data are valuable information assets that are generated or gathered by the scientific method. Darlington (2012b) opined that research data re-interpretable representations of information in a formalized manner suitable for processing. They recorded factual material commonly retained by and accepted in the scientific community as necessary to validate research finding; although the majority of such data is created in digital format, all research data is included irrespective of the format in which it is created. (EPSRC, 2012).

Research Data Management covers the processes of controlling the information generated during a research project; Barjak (2006) asserts that the term encompasses aspects of storage, access, and preservation of data produced from a given investigation; this includes issues such as creating data management plans, matters related to sharing data, delivery of services and tools, infrastructure considerations typically related to researchers, planners, librarians, and administrators. the development of research data across different fields has resulted to advancement in humane creativities such as science and technology depends on how data is analyzed, interpreted according to different perspectives for easy availability and accessibility of research data, recoded, organised, preserved and disseminated. The importance of research data has called for better attention from university libraries to take responsibility of a closer scrutiny to effectively leverage data or information scientifically captured. Libraries possess the managerial manpower or know – how needed for effective Research Data Management practices. It deals with coordination of all the resources of an organization through the processes of planning, organizing, directing and controlling in order to attain organizational objectives. Objective or goal is the most important aspect of management of whatever is deemed viable. According to Resser and Modugu, (1998) in Idoko (2005), management deals with the utilization of physical and human resources through cooperative efforts and it is accomplished by performing the function of planning, organizing, directing and controlling. This means that for any successful management of research data, the aspect of generation (planning), organization (coordination), storage (controlling) and dissemination (sharing) must be consciously and carefully kept abreast by human resources and media to be deployed to achieve the aim of the universities. The university libraries can managerially support research data generation, research data storage and organisation, and research data dissemination. Pinfield, S., Cox, A.M., &Smith, J. (2014) share the same concept of RDM, and explained further that it entails a number of different activities and processes associated with research data lifecycle, involving the design and creation of research data, storage, security, preservation, retrieval, sharing and reuse all taking into accounts technical capabilities, ethical considerations, legal issues and governance frameworks.

Empirically, studies were conducted on scholarly content management in higher institutions of Nigeria; Muhammad (2008), Ezema (2011) and recently, Abbas (2016), who examined Generation and management of scholarly content in Nigerian universities, and concluded that Nigerian scholars and their universities are grossly under-represented in the global information and knowledge industry because scholarly content in the country has remained poorly developed and disseminated owing to the decline in the research culture, poor infrastructure and the perennial funding problems for universities and other research centres capable of assisting generation of substantial or standard researches as compared to what students and other researchers are submitting to the universities in recent times. These challenges have implications for

knowledge growth and dissemination to the country, the continent and the world at large. The previous studies have established that research data result in the generation of various types of scholarly content originating for (cyclical) process, content is generated, reviewed, disseminated, acquired, preserved, discovered, accessed, and assimilated for the advancement of scholarship (Western Libraries, 2013a). This content may include pre-prints, peer-reviewed journal articles, monographs, enduring teaching materials, datasets and other research material, conference papers and proceedings, electronic theses and dissertations and grey literature (Research Information Network, 2011a; Royster, 2007; Johnson, 2002). Most of these contents were generated based on mandates or laws warranting that a deposit of research output should be submitted to the research and documentation office or to the university library. Meanwhile, no previous study in this area has clearly studied mode of generation of research data in university libraries; this study had provided response in this regard. And as Abbas, (2016) had observed, the low level of representation of scholarship of Nigerian scholars resulted from the problems associated with proper research data management. This is more prevalent in Northwest as observed by Mohammad (2008), who investigated scholarly content management in institutions in Kano state metropolis.

Storage and preservation of information sources and resources have been a big issue for information or data professionals since time immemorial especially considering the format in which they often occur, Witt (2008). The models used by the librarians and researchers to preserve the research data in universities were computer at work/office, university servers, university digital archive, external web server, hardcopy, e.g. print-outs, notebook, portable storage devices, computer at home, digital archive of discipline, and my blog, Abbas (2016). However, divergent with the findings of the present study were studies by Lord et al. (2004); Marshall et al. (2006) and Groenwald and Breytenbach (2011). Lord et al. (2004) reported on a study that examined the status at the time of the provision and the future needs of the preservation of primary research data in the UK within the e-Science context. Marshall et al. (2006) conducted a field study to examine the current state of personal digital archiving in practice and found that researchers owned multiple computers and other digital recording devices, such as digital cameras, camera phones, digital video recorders and CD or DVD burners for personal preparedness for data storage. Also, Pinfield (2014) highlighted that RDM is underpinned by processes with technical implementations including data repositories, hardware and software allowing for storage and transport of different types data. These evidences have shown that librarians and experts have deployed efforts to achieving lasting strategies and/or technologies that could be deployed to ensure information sources and resources remain adequately alive and accessible regardless of time and season. This is because, once a record, research data, or information resource is generated, they must be stored for long-term availability and reuse. Fortunately, with the explosion of technology, institutions are now resorted to the use of Institutional Repository (IR) which is an advance archival system used to collect, ensure long-term storage period for purposes of validating the research, furthering knowledge and to aid preservation, access and reuse. There are a number of technologies and hardware devices used to store research data and scholarly contents by expert of data management service in several universities currently since the introduction of ICT to librarianship profession. According to Witt (2008) data backup and storage practices by researchers are largely done on local computers and external hard drives, with departmental IT units, or in cloud services. On the

contrary Salo, (2010), argued that portable media such as external hard drives, CDs, DVDs, and USB devices are not suitable for long term storage of primary materials, research data and records as they can be easily misplaced or corrupted due to damage. According to Salmi, (2009), other means of research data preservation:

1. Provision of computers/servers
2. Repositories/archives
3. Establishing policy to upload data into websites
4. Offer more training/conferences
5. Encourage students to publish
6. Encourage more sharing of data/findings

Research data are generated, organised and stored to facilitate access and re-use for development of research. New discoveries depend on access to existing data and information, this is confirmed by Eisend (2002), who observed that data dissemination first occur through publication; the means by which scientists and researchers endeavours to move into the public sphere (Cronin, 2003). Without publication, years of scientific toil might easily be lost to the world at the demise of the scientist, or the scientist(s) would miss out on the evaluative benefits of peer review (Clapham, 2005). As Tabasum and Jan (2011) opined that publishing is a hallmark of good scientific research, and the aim is to disseminate new research knowledge and findings as widely as possible in a timely and efficient manner. According to Ngobeni (2012) scholarly disseminations and outputs consist of peer-reviewed journal articles, peer-reviewed monographs, peer-reviewed conference proceedings, and peer-reviewed research-based books. But researchers do not only communicate to give peer-reviewed scholarly outputs; besides communicating to get advice, learn about new methods or theories or hear about new results, scientists communicate informally to collaborate on research, co-author formal publications, mentor graduate students, and also to gossip and be creative (Tabasum & Jan, 2011; Koku et al., 2001; Allen, 1991). Koku et al. (2001) observe that scholars have to get their work out to the world if they want to advance scholarship, influence public opinion, advise policy makers, or promote their careers. This is why the study is necessary as it would reveal the strategies for effective research data management in federal university libraries in Northwest zone, Nigeria.

The paper based research data is the conventional method for recording discoveries before the advancement in technology and internet service. Paper-based resources are also accessible and considered one of the most reliable information sources since time immemorial. Allen (1991) claims that formal written communication is the most accepted form of reporting on scientific research within the scholarly community, while other scholars argue that informal research communication is equally important not only through all the stages of a research project, but also in the communication of intermediate results to fellow scientists (Barjak, 2006). To concur, Baptista and Ferreira (2007) also posit that informal communication has always played an important role in scholarly communication evidenced by the existence of invisible colleges. The advent of computers and internet services and other supporting platforms technologically built have given a variety of options to handling research data. The study sought to investigate

management strategies applied to research data in the university libraries. Hence having a common system of strategic approach to research data management will assist Nigerian scholarship in the world leading journals.

### **Statement of the Problem**

Research Data Management (RDM) is essential to enable more transparent and accessible research outcomes as managing data is an integral part of the research process in any field or discipline. Darlington (2012a) found that among the benefits of RDM are reduction in duplicated work, inspiration for new/continuation research and funding, basis for knowledge extraction from aggregated data, greater transparency of research, improved basis for validation, obviating the need for re-collection and generation, providing basis for reliable data citation, and increasing scholarly output.

However, in spite of these tremendous benefits of RDM, the issues of proper management have been the prevalent factor in Nigerian universities (Nnadiukwu, 2013). He further observed that, in Nigerian Universities, generation of research data is not the aspect of RDM that is faulty; instead storage and dissemination. Publication remains a vital link between researchers and the body of knowledge; this is a problem because storage and organization of what is to be escalated has not been adequately done - which is a missing component in universities of Nigeria. This has also revealed in Ondari-Okemwa (2007), who confirms that most Nigerian Universities have been reeling from problems that reduce their scholarly productivity and visibility. Nigeria will continue to remain a developing country if research data are not leveraged, as part of the requirement for knowledge society; where information is adequately generated, organized, preserved and disseminated.

Sequel to this, the study therefore investigated management strategies applied to research data in Federal University libraries in Northwest Geopolitical zone, Nigeria, with a view of identifying the managerial role libraries played in Research Data Generation, Organization, Storage and Dissemination through the use of Qualitative Research Method and backed up with Narrative Based Research Design.

### **Objectives of the Study**

The main objective of the study was to identify management strategies applied by the libraries to research data in the Universities, in terms of; data generation, data organization, data storage, and data dissemination

### **Methodology**

Qualitative Research Method together with narrative research design was employed to conduct the investigation. The approach was employed in scholarly communication: vision and utilization by Tabasum and Jan (2011). On the other hand, the design is a specific type of qualitative research design that is understood as a spoken or written text on account of an event or action or series of events or actions which is chronologically connected (Czarniawska, 2004).

Seven federal universities in the North-West geopolitical zone formed the entire population of the study from which three prominent ones (ABU, BUK, and UDUS) were sampled out based on generations. From the three famous universities, the university librarian and the HOD research and documentation unit of each of the university libraries formed the 6 interviewees that participated in the interview being at the top managerial levels of the university libraries. Fortunately, the interview was highly participated. The prediction had earlier been made by Pickard, (2013), that the narrative based design is good for qualitative research method because it allows the participants to ‘freely tell their own story in their words. Similarly, Dimple (2016), used the design in their study ‘the dilemma of academic discourse’ because the authors were interested in the stories of the participants that have direct contact with the phenomenon.

Data relevant to the study was collected using the interview schedule and documentary analysis checklist, and analyzed in line with the view point of Creswell (2007) that suggests a narrative based qualitative data analysis that is done in three stages: data organizing and familiarizing, coding and reducing, and interpreting.

## Results and Discussion

### *Information about Participants of The Study*

The participants of the study are encapsulated in the following Table 1

**Table 1:** Information about Participants of the study

S/N	UNIVERSITY	CODE	RANK / POSITION	GENDER	HIGHEST QUALIFICATION	YEARS IN SERVICE
1.	ABU	P1	LIBRARIAN	MALE	PhD	32
2.	ABU	P2	HOD RBSD	FEMALE	PhD – IN – VIEW	31
3.	BUK	P3	LIBRARIAN	MALE	PhD	30
4.	BUK	P4	HOD SRDU	FEMALE	PhD – IN – VIEW	24
5.	UDUS	P5	LIBRARIAN	MALE	PhD	29
6.	UDUS	P6	HOD RDU	MALE	MLS	22

*(Source: Interview Response August, 2019)*

The table presents the population of the study together with codes that were used for verbatim narrative analysis of responses of the participants logically in relation to the research questions of the investigation. Code P1 for Ahmadu Bello University deputy librarian representing the university librarian: a man senior staff of the university who had PhD in library science and had been in service for 32 years. P2 for the head of reference and bibliographic service division (RBSD); a female and senior staff with 31 years of experience in the university currently completing PhD programme in the same field was also interviewed. Bayero University, Kano like ABU produced two interviewees; P3 and P4 for the university librarian (male) and Head of serial and research documentation unit (female) respectively. While the Librarian holds a PhD in library science and 30 years of librarianship experience, the HOD SRDU is currently completing a PhD programme in the same field and bags 24years working experiences in the library. The table further shows that two participants were also selected from Usman Danfodio University Sokoto: P5 and P6 for both the university librarian and HOD research documentation unit respectively. While both

are male, the librarian is senior staff of the university, holds PhD in library science and had been experientially 29 years in the system, the HOD holds a masters' degree in library science and had 22years of experience in librarianship work.

### ***Management Strategies Applied to Research Data Generation***

This section identified the types of research data generated in the three Universities, as follows;

**Table 2:** Research Data Generation and organisation

<b>DATA GENERATION AND ORGANISATION</b>			
<b>STRATEGIES</b>	<b>ABU</b>	<b>BUK</b>	<b>UDUS</b>
Policy Advocacy	✓	✓	✓
Donation s / Gifts	✓	✓	✓
Purchase	✓	✓	✓
Subscription	✓	✓	✓
Requests	✓	✓	✓
Fellowship	✓	✓	✓
Appeals to Faculties	✓	✓	✓
Database	✓	✓	✓
VIRTUA / KOHA	✓	✓	✓
Book Allowance	✗	✓	✗
Cataloging and Classification	✓	✓	✓
Indexing/ Abstracting	✓	✓	✓
Repository	✓	✗	✗

*(Source: Interview Response August, 2019)*

The table shows the summary of the management strategies applied to Research Data in the university libraries. The researcher had built the study on the Knowledge Management Process Model by Botha, A., Kourie, D. & Snyman, R. (2008), which comprise of three overlapping and interacting knowledge processes that give rise to knowledge usage namely: knowledge creation and sensing; knowledge organization; and knowledge sharing and dissemination. Hence to determine the conformity of the university libraries studied with the framework, first the policies on RDM were studied in parts and observations were made, and secondly, stakeholders were interviewed and deduction made bearing in mind the theory adopted for the study.

The response gathered in table above showed that in practice, there are a number of strategies the libraries employed to generate and organise research data. The summary in the table captured methods used by ABU to generate and organise research data, they are; mandatory submission policy, donation, gift, purchase, appeals to faculties and researchers, fellowships. While for organisation KOHA, repository, index and abstracting, cataloging and classification and database are in use. The librarian who indicated the above mention strategies explains further that; this was revealed by one of the participants that; constant encouragement. This was disclosed by one of the respondents in his words; *'unless they send to us voluntarily; actually we do appeal through the university, faculties and departments, and at any fora we meet with the staff, we always*

*emphasize to them the importance of depositing these things, because some of them will actually publish stuffs which they may even lose their personal copies, but if they deposit any in the library I am sure they will be there. But any other document that is generated as a requirement for certification must be deposited to the library' (P1).* This submission agrees with the findings of Sykes (2008) who revealed that there was an acknowledged difficulty for researchers in retaining or managing research data beyond the life of a project once the funding associated with the project ceases.

In addition to the foregoing explanations, BUK does similar to ABU with the exception of both the Book allowance as a strategy for data generation and Repository for organisation which is down at the moment. The participant further revealed that; *"we get these resources via many methods because they don't just come into the library by themselves: especially the journals, reports and other advanced research data, some came through purchase, some through subscription, some donation and some through gift" (P4).* *"Also as part of our duty we have been encouraging researchers, publishers and authors to bring in their research data into the library by creating personalized corners for displaying their collections for the benefit of the users that is if he/she is not ready to donate to the library" (P3).* While for organisation of research data, she further revealed that; *"The organisation of any collection in the library is normally done at the catalogue and classification departments. But specifically for journals and theses are done independently'; the organisation is done in the serial research and documentation unit of the library" (P4).*

Convergent to the foregoing revelations, interviewees from UDUS have in practice similar management strategies applied to research data generation and organisation. They revealed; *"the role played by library in the university's research data management process are generation or acquisition of RD, organisation of RD, preservation and storage of RD, and dissemination of RD to the university community and the outside world through opened access to the university repository and website" (P5).* In addition to that; *"library apart from doing the conventional services, it has also been actively involved in the digitization of research data collected in print or hard copies, design and management of library website, uploading research data from offline to online repository and are also involved in policy advocacy of the university in research related issues" (P6).*

The observation made from the foregoing comments, it becomes evident that strategies have been put in place to encourage research activities especially at BUK. knowledge creation and sensing of the knowledge management process model as revealed in Botha et al (2008) typically affirmed that the generation of research data can be linked to the tacit-to-tacit and explicit-to-tacit knowledge conversion patterns as described by Nonaka and Takeuchi (Botha et al., 2008:173). In the former, tacit knowledge is built and shared in face-to-face meetings and informal and formal shared experiences which traditionally had little reliance on KM technologies, presently increasingly, groupware application software is now being used to supplement or replace conventional meetings. In the explicit-to-tacit conversion phase, a knowledge management system should offer information retrieval and also facilitate the understanding and use of information. The system needs to facilitate search, exploration, classification as well as enable associations between

documents in order to assist the knowledge worker to form new tacit knowledge easily. The model showed that the least minimum form of research data is important in academic environment; hence the library is now mandated to sense and capture all relevant researches under this.

### ***Management Strategies Applied to Research Data Storage***

This section identified the types of research data generated in the three Universities, as follows;

**Table 3:** Research Data Storage

<b>DATA STORAGE</b>			
<b>STRATEGIES</b>	<b>ABU</b>	<b>BUK</b>	<b>UDUS</b>
REPOSITORY	✓	✓	✓
PORTABLE STORAGE DEVICE	✓	✓	✓
COMPUTERS	✓	✓	✓
EXTERNAL HDD	✓	✓	✓
DATA CURATION	✓	✓	✓
MY BLOG	✓	✓	✓
HARD COPIES	✓	✓	✓
SHELVES	✓	✓	✓

*(Source: Interview Response August, 2019)*

On management strategies for research data storage the summary in the table above showed that ABU and BUK are at the forefront in the RDM practices in terms of storage. Electronic data are now being stored using ICT device such as computers, HDD, DVD, flash drives, repository, my blog, data curation and hard copies. While for non e-resources cabinet and shelves were in use. Archive is the only area of long term storage or preservation that has not been fully implemented in the libraries. This was quoted by one of the respondents that; *“we have not being able to establish a good archive but a times we do when we want to weed out materials we don’t want to get rid of.”* (P1). BUK and UDUS are yet to have functional repositories for electronic research data. To back the observation up, comments on the management strategies for research data are quoted below;

*“You know that we have different kinds of resources; we have print and softcopy. Even the print we have different categories; we have books and manuscripts – for manuscripts we file them in covers or jars and are stored at the reserve section of the library because of their fragile nature and are easily mutilated. User of such research data are strictly supervised as they access the resources. While for the softcopies, we have different storage facilities like external hard disks, CDS, flash drive, DVD for multimedia resources. We have some on our offline databases which is the Institutional Repository which had not been fully implemented due to lack of finance.”* (P3).

One of the participants from BUK university library revealed that *“For storage of research data is manually. After storing them, we transfer the data to computers because we have laptops*

*whereby we transfer all our transactions. Moreover, the library has been trying to automate resources using the VIRTUA Integrated management software but along the way, the library could not continue due to high maintenance fee. So now the library is thinking of migrating to KOHA Integrated Library Software to automate resources may be if that is done, all units will be harmonized into a single interface which will be accessed through the Online Public Access to Catalog (OPAC).” (P4)*

In another convergent view to the foregoing revelations, an interviewee from UDUS complex library iterated that *“we are still operating at a level close to expectation. The library is working on full automation and already digitization is ongoing, which is the first step we are taking managerially to organise and store our research data. For subscribed journals, we download and store them on our computers, hard drives, and websites and even on external storage media as backup” (P6).*

These results suggest that both the universities and individual researchers were aware of the need to maintain the long-term accessibility of their research data and other information and took measures to guard against loss or inaccessibility of the information. In enforcing this requirement for their students to submit theses in PDF format, the universities were also complying with the National Information Standards Organization (2007:37) recommendation that encourages authors to create born-digital content in specific formats that would facilitate long-term accessibility.

These results are somewhat divergent with results from previous studies (Groenwald & Breytenbach, 2011; Lord et al., 2004; Marshall, Bly & Brun-Cottan, n.d.). Lord et al., (2004) reported on a study that examined the status at the time of the provision and future needs of curation of primary research data in the UK, within the e-Science context. Marshall et al. (n.d.) conducted a field study to examine the current state of personal digital archiving in practice. The participants in the study had each owned multiple computers, and other digital recording devices such as digital cameras, camera phones, digital video recorders, and CD or DVD burners. Groenwald and Breytenbach (2011) investigated the awareness about digital preservation and what must be done to preserve valuable original digital materials. The participants in the study were mostly from South Africa. These studies revealed that researchers and home computer users in general possess the knowledge, general awareness and consistent usage of preservation strategies and management of the digital objects they had created on their personal computers, but the set back is the availability of the resources for use. Although the current study results suggest increasing awareness among computer users about digital preservation, still it is important that they continually be exposed to more knowledge and training to cement their knowledge and expose them to new strategies and new knowledge. This is critical especially since the technology environment in which they live is quite dynamic. As the Library of Congress (2013b) argues, —one of the still unfolding impacts of the computer age is that everyone now must be their own digital archivist.

The Knowledge Management Process Model advocates for the institutional adoption of knowledge repositories as part of their knowledge management technology infrastructure (Botha et al., 2008:145). The universities surveyed are making strides towards establishment and use of knowledge repositories. The IRs that has so far been implemented in the universities is repositories for the knowledge generated within the universities. Such knowledge exists in codified formats (Karlsen, 2005) as journals, conference proceedings, and electronic documents (Rowley, 2000). According to Botha et al. (2008), the purpose of IRs is to enable online access to knowledge and to solve the problems created by the current problems of information overload whereby enormous amounts of digital information are created but thereafter are increasingly difficult to find, access, present and maintain. Institutional repositories can be considered as intellectual capital repositories which according to Botha et al. (2008) are tools that augment the body of knowledge by bringing relevant data or expertise to people who need them when they need them. With the growing awareness and acceptance of IRs it is hoped that northwest university and Nigerian universities research data will increasingly become well interested and acquitted with strategies for storage of research data especially in digital form to increase access and visibility.

### ***Management Strategies Applied to Research Data Dissemination***

This section identified the types of research data generated in the three Universities, as follows;

**Table 3:** Research Data Dissemination

<b>DATA DISSEMINATION</b>			
<b>STRATEGIES</b>	<b>ABU</b>	<b>BUK</b>	<b>UDUS</b>
Website	✓	✓	✓
Hard Disk Drive and Flash Drive	✓	✓	✓
DVD or CD	✓	✓	✓
Fm Radio	✓	✓	✓
Buletins and Newsletters	✓	✓	✓
Journal Databases	✓	✓	✓
Repositories	✓	✗	✗
Electronic Mails	✓	✓	✓
Web 2.0	✓	✓	✓
Hard Copy	✓	✓	✓

*(Source: Interview Response August, 2019)*

On management strategies for research data dissemination to users, a number of responses were gathered which were closely in agreement with Maron and Smith (2008) in an investigation of current models of digital scholarly communication, surveyed colleges and universities in the United States and Canada and noted that in the digital age, blogs, electronic mails, social media platforms, discussion forums, and professional and scholarly hubs are gaining popularity as methods of scholarly communication.

Drawing from the narrations of the participants, that libraries had been using emails, web 2.0, bulletins, billboards, newsletters, external storage media, and only one university library is

currently using repository to disseminate research data to users online, while another operates currently an offline repository which is only accessible within the library. Some of their comments are highlighted below:

*“We have about nine divisions in this library, so it depends on what category of information the user needs. But this division of the KIL library is tasked with dissemination of research data. We share research data through emails and our repository is there for use.” (P2). “To disseminate our resources including research data we have our Library Newsletters or Library Updates, the University Bulletin, BUK FM Radio, University Website, Whatsapp, Facebook; these become necessary as the world has changed.” (P3).*

The libraries also disseminate locally born research data (non-electronic) using the old library schemas. One of the respondent explained that; *“it depends on the resources, books are done in the circulation, reserve and references at times, that of journals and theses are mainly done in the serial research and document unit and no other place. The display i.e. for new arrivals like the theses and dissertations and the current journals purchased or subscribed by the library are normally showcased for about two to three weeks for users to see. Once new ones arrive again, we pick off the old ones to the backset” (P4).*

These strategies are a welcomed idea to practicing research data management in the universities. But as Lewis (2010) has declared that taking institutional repositories acts as a starting point for data curation is the key to RDM best practices. This is because the need to reach out to the wider world should occupy the center stage in the quest to management research data. This is a problem because only ABU have been able to build and maintain functional repertory although yet to capture all her resources. This is why in the ranking of world universities ABU is normally ranked higher than both BUK and UDUS.

Furthermore, as revealed by Obannaya, (2010) research data is also among the six objective indicators for ranking world universities, which are: number of highly cited researches, number of articles published in nature and science, number of articles indexed in science citation index and in social sciences index. The low level of publication and citation of African scholars especially the Nigerian scholar has been indirectly due to level of RDM. The only initiative that it thriving in the 21<sup>st</sup> century is the “repository”, all of which have taken up but had been dented with the lack of maintenance culture.

From interviews with the university librarians and directors of research at the universities, the results confirmed that, at the moment a lot of the other content produced in the universities other than peer-reviewed articles, theses and conference proceedings is not deposited in the IR. Content currently excluded from the IR in the universities surveyed includes multimedia, course material, technical reports, magazines, departmental reports, and others. In a study of IR deployment in the US, Lynch & Lippincott (2005) found that the contents of IR were not only e-prints and electronic theses and dissertations, but digitized special collection materials, multimedia, course materials and datasets, conference proceedings and presentations, technical

reports and working papers, e-books and university publications and many other forms of institutional records. A similar situation exists at the California Polytechnic State University whose IR (DigitalCommons@CalPoly) captures a broad range of content including architectural plans, master plans, master's and undergraduate essays, eBooks, campus periodicals, annual reports, press releases, power point presentations, abstracts, alumni publications and conference proceedings (CalPoly, 2009). This goes to show that the IR can effectively be an avenue for preserving an institution's memory by storing and managing its relevant information both formal and informal. The results revealed that most of the institutions surveyed faced difficulties recruiting the conventional content such as journals, theses and conference proceedings and had therefore not ventured into the broader variety that other institutions were recruiting for their IRs.

The Knowledge Management Process Model (KMPM) asserts that organisations must invest in knowledge bases or repositories to facilitate access to knowledge required by its knowledge workers. The study results showed that the universities in surveyed had implemented institutional repositories which were playing a crucial role in ensuring that the knowledge created by researchers in the universities in northwest geopolitical zone was captured and properly organized so that both local and international scholars could access it now and in the future. KMPM advises that the scope of the content of knowledge repositories should include knowledge assets that provide information on the organisation's products, services, customers and business processes such as best practices, white papers, user manuals, multimedia objects, text files, learning material, and others (Botha et al., 2008). According to Botha et al., the main function of the knowledge repository is the inclusion of data and information from sources such as newspapers, journals, analyst reports, other databases, field reports, the internet and presentations. Therefore, as the study results showed, except for ABU library, the knowledge repositories at other two universities surveyed fall short of this scope. Within the literature, institutional repositories are described as repositories of institutional knowledge, intellectual capital or an organisation's knowledge assets (Eden & Doctor, 2008; Branin, 2003). Hence, going forward, with the exposition made by this investigation on effective RDM practices, university libraries in Nigeria must move into developing and maintaining knowledge repositories that can be accessed from anywhere. By this the world body of knowledge will find essence to reckon with Nigerian scholars existence in the place of contribution. Nigeria universities must upscale their business and stop localizing research data to the consumption of just faculty or department members or students.

## **Conclusion**

The study has identified management strategies applied to Research Data in University Libraries in Northwest zone, Nigeria. It was found that all stages RDM ranging from data generation to data dissemination formed a chain of system that must not be broken. This is found similar to role library has been playing since time immemorial, hence the libraries possess the requisite management strategies for research data and could support the universities efforts to manage its knowledge assets through constant updates to suitable technological platforms. Among these strategies, the institutional Repository is found encompassing: it could serve or contain the RDM chain (i.e. data gathering, organisation, storage, and dissemination) synchronously.

Therefore, more attention should be given to building a reliable and sustainable Institutional Repositories in the universities in Northwest zone, Nigeria.

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