Preservation Methods and Access to Digital Materials on Research Output of Users in Federal University Libraries in Northern Nigeria

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Abstract

The study investigated the preservation methods, accessibility to digital materials and their influence on research output of ICT librarians and lecturers in 22 federal universities in Northern Nigeria. The study was guided by the three objectives and three research questions to capture methods of preservation, continuous and limitless accessibility as well as use and extent of the use of digital materials on research output of ICT librarians and lecturers respectively. Descriptive survey was employed with target population of 12,691 respondents (161 ICT librarians and 12,530 lecturers) in 22 conventional and specialized Federal Universities in Northern Nigeria. Multi-

stage sampling technique was used to select 456 respondents (79 ICT librarians and 377 lecturers) drawn from nine federal universities. Structured but four point rating scale questionnaire was used in data collection. Out of 456 copies of questionnaire administered, 386 copies were filled and returned. Mean and standard deviation (descriptive statistics) was used in the analysis of data while 2.50 mean score was adopted as the criterion mean. Findings showed that digitization ($\bar{x} = 3.17$) was the most adopted preservation method to digital materials; the use of digital preservation software ($\bar{x} = 3.00$) promote continuous and limitless accessibility to digital materials. Other findings showed that journal articles ($\bar{x} = 3.40$) facilitate access to digital materials, while E-journals ($\bar{x} = 3.27$) were used very often and often in Federal University Libraries in Northern Nigeria. The study recommended training program, reactivation of digital preservation software and scholarly communication among ICT librarians and lecturers in federal universities in Northern Nigeria.

Keywords: Preservation, Digital materials, Accessibility, Research output, Library users, Universities, Nigeria.

Introduction

Research has been perceived by different scholars from different point of view and approaches. To some, it is a quest for knowledge, a systematic method of inquiring into existing phenomenon. Nevertheless, it is characterised as a carefully but detailed and organised study that help substantiate information and proffering solution(s) to specific problems, concerns or issues affecting humanity. Ibraim (2013) described research as systematic study or scientific method of enquiry into situation or number of situations through laboratory, field or scientific method, thereby discovering facts, create or reverse an assumption, or to develop a plan of action based on the facts discovered. Sambo (2015) enumerated the various types of research to include: applied research, case study research, *ex post facto* research, action research, and experimental research, among others.

Universities in Nigeria are established to produce human resources and workforce, as

the objectives of establishing universities include teaching, learning, research and community services. Libraries attached to universities perform functions that are directly linked to the objectives of establishing universities. University libraries are established to support the overall objectives of teaching learning and community services, through acquisition and provision of relevant collection to support undergraduate and postgraduate teaching and researches. University libraries in the modern era are expected not only to acquire, but also to preserve their collection through the process of digitalization. Preserving collection in libraries is advancing from the traditional method to modern methods. Printing on paper which has largely been relied upon for the preservation of information over many centuries is the dominant traditional method. Theses printed materials are proned to deterioration through biological, pollutants, wear and tear through constant usage and mishandling by users and library staff; excessive environmental factors, etcetera. (Dada, 2016). With these shortcomings on the physical well-being of library collection, it is imperative to adopt the modern method of preserving the collection thus digitization.

Digitization is the process of converting the printed materials into the digital/electronic format which can later form databases (Saka, 2013). The printed information resources that could undergo digitization include: Serial publication, project thesis/dissertation, technical reports, and etcetera. The digital collection include: e-Journal, e-thesis, e-books, and databases, respectively. Digital materials are easily made visible and a pedestal of information access requisite for research output. The quest for digital materials could also be attributed to its ease of use, support for technological inclusion, popularity among scholars and publishers as well as supported by multiple interfaces that could support active participation of stakeholders independently, and not infringing on access, retrieval and storage; at the same time leaving an opening for the choice of preferred preservation method adopted at individual and institutional levels. This im-

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plies that the choice for a preservation method is aimed at addressing technical issues that can promote the quality of research output and quantity of information resources. To the individuals such as students, researchers and academics, it puts them on a par with librarians advocating deposition of local contents in their respective libraries (repositories) to promote the uniqueness of research output and foster contributions to the scholarship universe.

The paradigm shift for the preservation of digital materials among scholars, institutions, universities, and governments could be because it has been able to address complexities of inadequate information sources, enhance long term access, sharing and utilization of information in diverse formats. Other considerations of digital materials preservation are to overcome the information explosion of information sources which requires a systematic procedure for evaluation, subscription and safeguarding against lowering the quality and create avenue for expanding the amount of information/ information resources in the institutional repositories for the enhancement and support of organizational goals and objectives. Literature search revealed that access to information resources can efficiently improve the teaching and research output which according to Lynch (2008) are necessary for strengthening the need for digital data preservation and for proper digital repositories respectively.

Statement of Research Problem

Academic staff in universities are charged with the responsibilities of teaching, research and providing community services. For these functions to be effectively discharged by ICT librarians and lecturers there is the need for them to access digital materials for optimal exploitations to post their research out and promote research productivity level. Preliminary investigation by the researcher revealed that academic staff using university libraries face challenges in accessing the digital materials and to some cases these categories of materials are not well preserved by digital means. All these shortcomings affect not only the duration of access to digital materials but also their research output. The

study therefore seeks to find out the preservation methods, as well as the activities designed to ensure easy accessibility to re-search output of ICT librarians and lecturers of Federal Univer-sity Libraries in Northern Nige-ria.

Objectives of the Study

The study was designed to achieve the following specific objectives:

1. Investigate the preservation techniques to digital materials adopted by the federal uni-versity libraries in Northern Nigeria.

2. Ascertain activities under-taken to support continuous and limitless accessibility of digital materials of federal university libraries in North-ern Nigeria.

3. Determine the research pro-ductivity of ICT librarians and lecturers based on their usage of digital materials in Federal University Libraries in North-ern Nigeria.

Research Questions

The study was designed to pro-vide answers to the following questions:-

1. What preservation methods of digital materials are adopted by the Federal Uni-versity Libraries in Northern Nigeria?

2. What activities are adopted to support continuous and li-mitless accessibility to digital materials of the Federal Uni-versity Libraries in Northern Nigeria?

3. What are the research outputs of the ICT librarians and lec-turers based on their usage of digital materials in Federal University Libraries in North-ern Nigeria?

Review of Related Empirical Studies

Attitude of librarians towards research with associated factors were examined. Three research questions were designed to de-termine whether or not libra-rians are really publishing, fac-tors affecting their attitude and ways to enhance research out-put of librarians in Imo State, Nigeria. Survey research was adopted with 75 librarians pos-sessing first, master and docto-rate degrees in librarianship. There was no sampling due to small size of population. De-

scriptive statistics was used to analyse data. It was discovered that over 50% of librarians have never published, while journals tendsto be publishing media of librarians. Finance, time, irrelevant and out dated collections were the serious factors affecting the attitude of librarians in Imo State to library and information science research. The study recommended that creation of time, author collaboration, financing research, use of current collection were among ways to enhancing research output of librarians in Imo State, Nigeria. (Akinde and Nse, 2011).

Saka (2013) conducted conceptual and empirical study of determine the trends in the digitization of thesis and dissertation in Nigerian universities. Literature searched revealed that digitization projects in some of the first and second generation universities in Nigeria. Mobile phone calls were used to confirm whether or not the availability and use of software and accessibility to research works in these universities revealed that Ahmadu Bello University Zaria and University of Nigeria, Nsukka both uses D space software to digitize thesis/dissertation and access to the digitised resources was through respective web pages and university website as for A.B.U Zaria while access to digitized resources was through institutions website Un.edu.ng respectively.

Ugwuona and Dike (2015) conducted a study to find out the relationship between library resources and research productivity in the Nigerian health based Research Institutes. Descriptive research was used in population consisted of 198 research staff in five health research facilities and 166 staff was sampled for the study. Observation checklist and questionnaire were the instrument used to collect data while descriptive statistic was used to present date on the table. Study found that researchers were productive in publishing and the highest productivity indicator was discovered from peer review journal articles.

Assessing the preservation of library collection in Federal College of Education, Zaria, Dada (2016) reported that the most available collection in this academic library were textbook and electronic resources. Study revealed inadequately ventilation poor network leading to

information literacy problem were agents of deterioration of college library collections. Hindrances to preservation of collection include inadequate equipment and knowledge of the preservation on the part of libraries.

Saka, Abbas and Salman (2017) investigated the management of research output of undergraduates and postgraduates in university libraries in Kenya (Nairobi) and Nigeria (Abuja). In order to generate descriptive statistics for the study, five research questions were used, and contains variables such as programme covered, format of submission, methods of processing, arrangement and organization, as well as methods of preserving, and challenges involved in the management of research output. Survey research was used with six universities in the capital cities of Kenya (Nairobi) and Nigeria (Abuja) and six university librarians respectively. Self designed questionnaire was used as instrument for data collection. Simple tabulation and ticking appropriate boxes were methods of data analysis. Results showed that research output

were acquired and submitted to university libraries in both hard and softcopies. Preservation strategies were mostly through shelving and computerisation of collections. The major challenge to the management of research output was space.

Methodology

Descriptive survey design was used and the population consisted of 12,691 respondents, with a breakdown of 161 ICT librarians and 12,530 lecturers in 22 Federal Universities in Northern Nigeria. Multi-stage sampling method was used. Otaha (2015) views multi-stage sampling as sampling that consisted of processes, stages, and sampling methods to arrive at reasonable and appropriate sample size. Thus, the method was used to select nine (9) universities, using stratified sampling method, while proportionate stratified sampling was used to select 377 lecturers and 79 ICT librarians.

The researchers used two sets of questionnaire to collect quantitative data and response rate showed 321 lecturers and 65 ICT librarians in nine Federal

Universities in Northern Nigeria. The objectives 1 and 2 were designed in the questionnaire items to elicit responses from ICT librarians on the preservation methods and activities undertaken for continuous and limitlessaccessibility to digital materials respectively. Objective 3 was to investigate the research productivity of ICT librarians and lecturers using digital materials, and was designed into two parts in the questionnaire items. The first part was to elicit responses from ICT librarianson use while the second part was to elicit responses from lecturers on the extent of use of digital materials for research output. Mean and standard deviation was used to analyse data. The list of the responding universities appeared in Table 1

Table 1: Response Rate

University	Lecturers		ICT Librarians		Total		
	C/D	C/R	C/D	C/R	C/D	C/R	%
A B U, Zaria	65	58	16	14	81	72	88.9
B U K, Kano	55	46	10	8	65	54	83.1
University of Jos	40	33	10	6	50	39	78.0
F UT, Minna,	25	22	12	10	37	32	86.5
UNIMAID, Maiduguri	30	27	6	5	36	32	88.9
A T B U, Bauchi	25	21	4	4	29	25	86.2
U D U, Sokoto	60	44	8	7	68	51	75.0
Fed. Univ. of Agric., Makurdi,	27	26	7	6	34	32	94.1
Modibbo Adama Univesity, Yola	50	44	6	5	56	49	87.5
Total	377	321	79	65	456	386	84.6

Key: C/D =Copies Distributed and C/R = Copies Retrieved out of 456 copies of questionnaire distributed to ICT librarians and lecturers in 9 Federal Universities in Northern Nigeria, 368 (84.6%) were duly completed and retrieved. All the retrieved copies of questionnaire were useful for data analysis.

Data Analysis and Interpretation

Research question 1: What are the preservation methods for digital materials by federal universities in Northern Nigeria?

In the identification of the preservation methods of digital materials adopted by federal universities in response to the first research question along with the first specific objective of the study, the opinions of the ICT librarians were solicited. Their responses to the items were used for the first research question: What preservation methods of digital materials are adopted by federal universities in Northern Nigeria? The decision on whether the preservation methods were adopted or not were based on a criterion mean of 2.50. Mean score being lower than criterion mean would indicate that such preservation method was not universally adopted in university libraries.

Table 2: Preservation Methods of Digital Materials

S/No	Preservation Methods for Digital Materials	SA 4	A 3	D 2	SD 1	n	FX	$\bar{X}$	StD	Decision
1.	Encapsulation	16	17	16	16	65	163	2.51	0.01	Accepted
2	Refreshing	14	22	13	16	65	164	2.52	0.02	Accepted
3.	Technology preservation	14	33	7	11	65	180	2.77	0.27	Accepted
4.	Digitization	23	35	2	5	65	206	3.17	0.67	Accepted
5.	Information Emulation	18	16	15	16	65	166	2.55	0.05	Accepted
6.	Information Migration (Normalization)	14	31	8	12	65	177	2.72	0.22	Accepted
7.	Replication	12	26	12	15	65	165	2.54	0.04	Accepted
	Weighted Mean							2.71	0.21	

Key: **SA** = Strongly Agree, **A** = Agree, **D** = Disagree, **SD** = Strongly Disagree, n = Number of Retrieved copies of Questionnaire from ICT Librarians, $\bar{X}$ = Mean and (criterion mean = 2.50)

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Data revealed that all the preservation methods listed for digital materials were adopted by the studied University Libraries in Northern Nigeria with the highest mean observed in item 4: Digitization ($\bar{X}$ =3.17, SD=0.67), followed by Item 3: Technology preservation ($\bar{X}$ =2.77, SD=0.27), Item 6: Information Migration (Normalization) ($\bar{X}$ =2.72, SD=0.22), Item 5: Information Emulation($\bar{X}$ =2.55, SD=0.05), Item 7:Replication ($\bar{X}$ =2.54, SD=0.04),Item 2:Refreshing ($\bar{X}$ =2.52, SD=0.02), and the least is Item 1: Encapsulation ($\bar{X}$ =2.51, SD=0.01). The weighted mean is 2.71 indicating that the preservation methods were adopted in all the study university libraries for continuous access to digital materials to support users' researches and research output. However digitization was considered as the most used preservation method.

Research question 2: What are the activities that are adopted for continuous and limitless accessibility of digital materials of federal universities in Northern Nigeria?

To ascertain the activities undertaken to ensure long term accessibility of digital materials in the selected federal universities in response to the second specific objective of the study, a number of items were assessed. The opinions of the ICT librarians on the items in relation to the research question "What are theactivities adoptedfor continuous and limitless accessibility of digital materials of federal university libraries in Northern Nigeria?" The decision was based on a criterion mean of 2.50. The data were presented in Table 3.

Table 3: Activities for continuous and limitless accessibility to digital materials

S/No	Activities for continuous and limitless Accessibility to Digital Materials	SA 4	A 3	D 2	SD 1	n	FX	$\bar{X}$	StD	Decision
1.	Use of digital preservation software	22	27	10	6	65	195	3.00	0.50	Accepted
2	Managerial commitment	11	36	5	13	65	175	2.69	0.19	Accepted
3.	Funding of preservation activities	7	34	11	13	65	165	2.54	0.04	Accepted
4.	Staff training on agreed procedure and processes regularly	14	28	13	10	65	176	2.71	0.21	Accepted
5.	Policy modification in-line with current preservation trends (Technological/technical requirements)	11	25	17	12	65	165	2.54	0.04	Accepted
6.	Planning for the future	15	28	12	10	65	178	2.74	0.24	Accepted
	Weighted Mean							2.67	0.17	

Key: SA = Strongly Agree, **A** = Agree, **D** =Disagree, **SD** = Strongly Disagree, **n** = Number of Retrieved Questionnaire from ICT Librarians, $\bar{X}$=Mean and (Decision mean = 2.50)

Table 3 showed that all the items listed were adopted by ICT librarians as activities adopted to ensure long-term accessibility to digital materials by the studied-federal universities. These are: Item 1: Use of digital preservation software ($\bar{X}$ =3.00, SD=0.50),Item 6: Planning for the future ($\bar{X}$ =2.74, SD=0.24), Item 4: Staff training on agreed procedure and processes regularly ($\bar{X}$ =2.71, SD=0.21), Item 2: Managerial commitment

($\bar{X}$ =2.69, SD=0.19) while Item 3: Staff training on agreed procedure and processes regularly and Item 5: Policy modification inline with current preservation trends (Technological/technical requirements) have the same mean score of ($\bar{X}$ =2.54, SD=0.04).The weighted mean was 2.67, which means that the activities examinedcan ensurefor continuous and limitless accessibility to digital materials with the use of digital preservation software as highest and popular activity.

Research Question 3: What are the research outputs of users of digital materials of Federal Universities in Northern Nigeria?

The influence of utilisation of digital materials on research outputs of the users was assessed in relation to the third specific objective and research question: "What are the research outputs of the users of digital materials from conventional and specialized federal universities in Northern Nigeria?" The impact of the use of digital materials was assessed on the basis of the books and their volumes, journal articles published, conference papers presented and magazine/newspaper articles, along with lecture notes. The two groups were assessed here to establish the opinions of the ICT Librarians on the use and that of the lecturers on the extent of use of the digital materials. The opinions of the ICT librarians were used because they are the recipients of such information resources in the university libraries. Their responses on the items are tabulated in Tables 4 and Table 5.

Table 4: Influence of digital materials use on research output

S/No	Output Facilitated by Access to Digital Materials	SA 4	A 3	D 2	SD 1	n	FX	$\bar{X}$	StD	Decision
1.	Books	26	35	2	2	65	215	3.31	0.81	Accepted
2	Chapters in a book	19	31	4	11	65	188	2.89	0.39	Accepted
3.	Journal articles	35	24	3	3	65	221	3.40	0.90	Accepted
4.	Conference paper	28	27	3	7	65	206	3.17	0.67	Accepted
5.	Magazine/newspaper articles	16	23	9	17	65	168	2.58	0.08	Accepted
6.	Lecture notes	12	24	18	11	65	167	2.57	0.07	Accepted
	Weighted Mean							3.00	0.50	

Key: **SA** = Strongly Agree, **A** = Agree, **D** = Disagree, **SD** = Strongly Disagree, **n** = Number of Retrieved copies of questionnaire from ICT Librarians, $\bar{X}$ = Mean and (Decision mean = 2.50)

Table 4 showed that the research output listed for the study have a mean score greater than the criterion mean of 2.50. The highest among them was Item 1: Journal articles ($\bar{X}$ =3.40, SD=0.90) followed by Item 1: Books ($\bar{X}$ =3.31, SD=0.81), Item 4: Conference paper ($\bar{X}$ =3.17, SD=0.67), Item 2: Chapters in a book ($\bar{X}$ =2.89, SD=0.39), Item 5: Magazine/newspaper articles ($\bar{X}$ =2.58, SD=0.08) and the list is Item 6: Lecture notes ($\bar{X}$ =2.57, SD=0.07). The weighted mean is 3.00. Journal articles tend to have mean score higher than other research output because journals convey current and reliable information which are mostly empirical works.

Table 5: Extent of use of digital materials for research output

S/No	Extent of Use of Digital Information Resources	VO 4	O 3	NO 2	R 1	n	FX	$\bar{X}$	StD	Decision
1.	E-thesis/dissertation	99	155	53	14	321	981	3.06	0.56	Accepted
2	E-journal	138	139	38	6	321	1051	3.27	0.77	Accepted
3.	E-books	95	148	63	15	321	965	3.01	0.51	Accepted
4.	E-reference materials	69	163	74	15	321	928	2.89	0.39	Accepted
5.	E-Conference papers	64	156	82	19	321	907	2.83	0.33	Accepted
6.	E-magazines/monographs	40	103	143	35	321	790	2.46	0.04	Rejected
7.	E-Technical reports	34	117	113	57	321	770	2.40	0.10	Rejected
8.	Databases	103	128	67	23	321	953	2.97	0.47	Accepted
	Weighted Mean							2.88	0.38	

Key: **SA** = Very Often, **O** = Often, **NO**= Not Often, R= Rare, **n** = Copies of Retrieved Questionnaire from Lecturers $\bar{X}$=Mean and (Decision mean = 2.50)

Table 5 showed that six of the items examined have a mean score greater than the criterion mean of 2.50. The highest among them was Item 2: E-journal ($\bar{X}$ =3.27, SD=0.77) followed by Item 1: E-thesis/dissertation ($\bar{X}$ =3.06, SD=0.56), Item 3: E-books ($\bar{X}$ =3.01, SD=0.51), Item 8: Database ($\bar{X}$ =2.97, SD=0.47), Item 4: E-reference materials ($\bar{X}$ =2.89, SD=0.39), Item 5: E-reference papers ($\bar{X}$ =2.83, SD=0.33). While the other two items have a mean score below the criterion mean of 2.50. They are Item 6: E-magazine/ monographs ($\bar{X}$ =2.46, SD=0.04) and Item 7: E-technical report ($\bar{X}$ =2.40, SD=0.10). The weighted mean was 2.88 this supports the responses of the ICT librarians that the use of digital materials facilitates the research outputs of the users in the selected federal universities. The mean score below the criterion in respect of

E-magazine/monographs and E-technical report was connected to that magazine contain funny issues and technical report was targeted to specialised fields.

Discussion of the Findings

Research question 1: What preservation methods to digital materials are adopted by Federal Universities in Northern Nigeria?

The result of the analysis on preservation methods to digital materials revealed that digitization was the most adopted preservation method to digital materials. This was followed by encapsulation, refreshing, replication, information emulation and information migrations. These were the preservation methods though digitisation was the most adopted preservation method by ICT librarians in the surveyed university libraries. This findings contradict that of Saka, Abbas and Salman (2017). The authors reported that research outputs acquired were submitted to university libraries in Nigeria and Kenya in both hard and softcopies and were preserved through shelving and computerisation.

Research question 2: What are the activities adopted for continuous and limitless accessibility to digital materials of the Federal Universities Libraries in Northern Nigeria?

The study revealed that the activities undertaken for continuous and limitless accessibility of digital materials of federal universities libraries in Northern Nigeria was the use of digital preservation software. The aggregate mean score of the table clearly revealed that all the activities were practised in the selected university libraries at almost the same rate as indicated by the observed standard deviations for the preservation of digital materials in the selected university libraries. The study revealed that digital preservation software has the activity with the highest mean score. This findings tally with that of Saka (2013) who reported that D space software was used to digitize theses/dissertations in Universities in Nigeria.

Research question 3: What research output of ICT librarians and lecturers used in digital materials in Federal Universities in Northern Nigeria?

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Result of the study showed that the impact of the useof digital materials on research output of the ICT librarians and lecturers in conventional and specialized universities is most reflected in the number of journal articles published, books and conference papers. This is because they are the most consulted materials by users of the library. The finding agree's with those of Akinde and Nse (2011) and Ugwuona and Dike (2015) respectively. Akinde and Nse, (2011) reported that journals were the publishing media or outlet of librarians in Imo State, Nigeria. The finding agrees with Ugwuona and Dike (2015) as the authors reported that researchers were productive in publishing while the highest productivity indicator was discovered in the peer reviewed journal articles.

Summary of Major Findings

The major findings from the study are summarized below:

1. Digitization was considered as the major and popular method adopted to preserve digital materials in the surveyed Universities in Northern Nigeria

2. Activities undertaken for continuous and limitless accessibility of digital materials of federal universities libraries in Northern Nigeria were the use of digital preservation software, managerial commitment, staff training and policy modification though digital preservation software was the most used activity.

3. Research output on which the preserved digital materials impact positive influence was journal articles.

Conclusion

The study has established that with the adoption of digitization as the major method of preserving digital materials in the studied university libraries, it shows that they are moving towards building institutional digital repositories of collections. On the other hand, digital preservation software has been widely used and accepted software in building repositories inuniversity libraries collection. However, both print and electronic journalarticlesserve as the medium for reporting research findings.

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Recommendations

The following recommendations are put forward:

1. Digitization is a tedious job. As such library staff members should not only be motivated but also undergo more trainings so as to be equipped with the technical skills required for the job.

2. Digital preservation software should from time-to-time be re-activated by the university libraries. As new software are manufactured, the old ones will be rendered obsolete. The quality and lifespan of the existing preservation software can be maintained.

3. Scholarly communication should also be reflected in textbooks, conference proceedings etcetera. This is because, as researches are conducted, they need to be reported in various outlets, publish in textbooks, journals or present the research findings at conferences and publish in proceedings.

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