

DIGITAL COMPETENCIES AMONG LIBRARIANS FOR PRESERVATION PRACTICES IN UNIVERSITY LIBRARIES

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Abstract

This study investigated the digital competencies among librarians for preservation practices in university libraries. This study adopts the descriptive research design. The population comprised 10, 210 professional librarians in Nigeria. Three zones were randomly selected: South-South, South-East and North-Central. From the 3 zones, three states chapter of Nigerian library association were selected using simple random sampling techniques: Akwa Ibom, Anambra and Abuja. Thereafter, 20 Librarians working in the various universities from each of the 3 states chapters of the Nigerian library association were purposively selected making a sample of 60 professional librarians. The instrument was validated by 3 experts. The Cronbach Alpha reliability method was used to test the internal consistency of the instrument. A reliability coefficient of 0.81 was gotten. Data collected was analyzed using descriptive statistics of mean scores and standard deviation. The study found that Nigerian university librarians predominantly recognize competencies including competence in checksum verification and integrity checking tools for digital preservation practices. The university preservation librarians exhibit generally low competency levels across essential digital preservation skills, with particular weaknesses in software proficiency, and integrity verification. Nigerian university librarians face substantial barriers primarily from funding shortages, poor infrastructure, management priorities, and mentorship gaps. The Nigerian university librarians overwhelmingly favor curriculum reform, hands-on training, mentorship, and international partnerships as primary strategies to bridge digital preservation competency gaps.

Keywords: Digital preservation, Preservation competencies, preservation practices, University librarians, Nigerian libraries

Introduction

A university library is a collection of books and other materials that are arranged systematically to aid easy access and retrieval of information (Ezejiofor, Agim & Ndanwu, 2022). University libraries are often considered the most important organ of universities because students and researchers conducting research within any conceivable academic discipline rely heavily on the collection of university libraries which reflect a vast range of interests and formats. The library as the university's central organ, is supposed to be properly supported financially. A University library is composed of various digital tools and technologies which support the research task of the university faculty and students (Nwalo, cited in Anaehobi and Agim, 2019).

Digital technologies have revolutionized preservation practices in university libraries, transforming traditional methods of safeguarding physical collections into sophisticated digital strategies that ensure long-term accessibility and integrity of scholarly resources. The shift from analog to digital preservation addresses the vulnerabilities of deteriorating print materials while introducing new paradigms for managing born-digital content, metadata standards, and data migration (Akpan, Akaeze & Nebo, 2016). In Nigerian university libraries, this evolution is particularly urgent amid rapid digitization initiatives aimed at preserving indigenous knowledge and institutional repositories against environmental threats like humidity and power instability (Ogu, Osaru & Yahaya, 2019).

The rise of digital competencies, encompassing skills in formats like PDF/A, emulation software, and tools such as LOCKSS or DSpace marks a critical competency for librarians to mitigate risks of data obsolescence and format degradation (Agim & Azolo, 2019). Recent studies highlight how AI-enhanced tools for automated integrity checks and metadata harvesting can extend the lifecycle of digital assets, yet adoption remains uneven in resource-limited settings (Oluwaniyi, 2015). University libraries worldwide now prioritize competencies in risk assessment, file validation, and sustainable storage to combat the "digital dark ages," where unpreserved content risks permanent loss.

In African contexts, particularly Nigeria, university libraries grapple with balancing preservation of cultural heritage materials with the demands of open-access mandates and growing e-theses repositories. Digital preservation requires not just technical proficiency but also policy frameworks for curation, authentication, and interoperability, as evidenced by pilots in Anambra State institutions (Varlamoff cited in Adetunla & Agbetuyi, 2018). This necessitates staff upskilling in tools like JHOVE for format validation and PREMIS for metadata, fostering resilience against technological shifts.

The integration of human-digital competencies redefines librarians as stewards of perpetual access, where proactive emulation and migration strategies prevent vendor lock-in and ensure future-proofing. Theoretical underpinnings from HCI emphasize user-centered design in preservation workflows, aligning staff skills with evolving standards like OAIS (Open Archival Information System) (Sawant, 2014). Nigerian

universities, facing acute challenges like bandwidth limitations, exemplify the need for context-specific competencies to sustain digital scholarship.

Ultimately, mastering digital preservation competencies empowers university libraries to support research continuity, comply with global standards, and democratize access to knowledge, positioning librarians at the forefront of institutional memory in the digital era (Iyishu & Nkanu, 2013). Owing to the fact that digital competencies are required skills and abilities expected to be acquired by librarians in university libraries to enhance their preservation practices, their non possession of these competencies is a challenge for the libraries to meet her 21st century mandate. It is against this background that this study seeks to examine the digital competencies for preservation practices in university libraries

Statement of the Problem

Ideally, university library staff should possess comprehensive digital competencies enabling seamless preservation practices, including automated integrity checks, standardized metadata application, and risk-managed migration strategies that guarantee long-term accessibility of digital collections amid technological evolution. Currently, however, Nigerian university libraries suffer from significant competency deficits: only few of the staff demonstrate proficiency in essential digital preservation skills, exacerbated by inadequate training, outdated infrastructure, and overreliance on basic digitization without sustainable strategies, leading to widespread format obsolescence and inaccessible repositories. Consequences include irreversible loss of scholarly output, estimated at 25% of e-theses vulnerable to bit rot which diminished

research credibility, funding shortfalls from non-compliance with global standards, and perpetuation of digital divides that marginalize African knowledge systems. Prior studies focus on general ICT adoption or AI applications but overlook granular digital preservation competencies, creating gaps in competency frameworks tailored to university contexts; this study addresses these voids

Research Questions

1. What are the core digital competencies for preservation practices in university libraries?
2. What are the current competency levels of preservation librarians in Nigerian university libraries?
3. What are the barriers to digital preservation skill acquisition among librarians in university libraries?
4. What are the strategies to promote digital competencies for preservation practices among librarians in university libraries?

Review of Related Literature

Digital Preservation practices

Preservation is a system of protecting contents of library resources for future use. Adetunla and Agbetuyi (2018) preservation involves both direct and indirect physical intervention for arresting or slowing down deterioration of library materials. Preservation is an act of protecting and shielding material from destructive influences that shorten their life span (Fatade, Agim, Irieguna & Nwosu, 2024). The library plays a

crucial role of protecting and preserving information-bearing resources from distortion, deterioration, and eventual loss because the materials are imperative. Preservation according to steward as cited in Kariuki, Karugu and Opiyo (2018) involves a rigorous respect for the integrity of the information resources and on appreciation of its role as an object of cultural heritage. They further note that it was a commitment to prolonging the life of the information resources through preventive action and through the use of stale materials and appropriate techniques of treatment.

Digital competencies needed by librarians to implement their preservation practices in university libraries

Competency is the skill a person requires to perform a task. Competency is the ability of an individual worker to do a job according to prescriptions (Akpan, Akaeze & Nebo, 2016). Competency as a state of being adequate in performing a task. It means the ability to perform using various andragogic skills. Competency is the ability to do something well. According to the European Commission cited in Agim and Azolo (2019), a competence is a combination of knowledge, skills and attitudes appropriate to the context. Among other possible competences, key competences are those which all individuals need for personal fulfillment and development, active citizenship, social inclusion, and employment.

Digital competence is the set of skills, knowledge and attitudes that enable the confident, creative and critical use of technologies and systems. It is the skill set that enables a person to be a confident digital citizen, to interact and collaborate digitally, to produce work digitally, and to be confident in handling data and computational thinking

(problem solving) (Curriculum Reform Division, 2018). Digital competence is a combination of knowledge, skills and attitudes with regards to the use of technology to perform tasks, solve problems, communicate, manage information, collaborate, as well as to create and share content effectively, appropriately, securely, critically, creatively, independently and ethically (Anders, 2016)

In this regard, librarians will need to apply these digital competencies to enable them implement their preservation practices on the electronic information resources in the libraries. It is the responsibility of the library staff to acquire information literacy (Obiekwe & Agim, 2021) and digital competencies so as to enable the implement their preservation practices and protect these electronic information resources. One of the major digital competencies needed by librarians to implement their preservation practices on electronic information resources in university libraries is to have computer literacy skills. According to Wenborn (2018), for the creation and accessibility of digital resources to be possible, librarians would be expected to learn new skills for proper implementation.

Akintonde and Awujoola (2022) in their study on the skills and digital preservation practices by library personnel in some selected university libraries in South-West, Nigeria, noted that the computing skills possessed by library personnel were word processing skill, printing skills, and database creation and updating skills. On computing managing skills, the findings revealed that library personnel can solve simple technical issues on their system. Majority of the library personnel can resolve issues with Office software (Microsoft Office, Open Office etc.) for preservation programmes without assistance. On internet navigation skills, the findings revealed that the majority

of the respondents can browse and navigate the internet and use different online search engines which also revealed that they have the ability. Furthermore, the majority of the respondents have web page creation skills.

Librarians that preserve EIRs should have digital preservation skills. A constant need to improve Information Technology (IT) staff skills for them to keep up with the technological obsolescence is needed (Kariuki, Karugu & Opiyo, 2018). Hodge (2018) stated that technical knowledge on EIRs preservation is basically missing among staff involved in preserving these resources. On the same point, Rieger (2018) stressed that most of librarians in developing countries apart from having low ICT skills but also lack skills in digital preservation. In addition, Pandey and Misra (2014) pinpointed that information professionals should have experience in all areas of EIRs processing and handling. It is for this reason that one should develop a schedule of service that will attract and retain the skilled information professionals who are available in the field as well as other professionals who are within the wider parameters of library science.

According to Hazarika (2020), the following strategies and competencies are needed when handling a media storage device for preserving information; moderating and making temperature and humidity stable helps keep storage alive, having a storage device that can read older media, having hardware that can connect to older media devices and also having software that can read older files from the storage devices. Librarians will be required to have skills and digital competencies in determining the genuineness of the two categories of storage devices. The two categories of the storage devices are the magnetic tapes storage devices such as magnetic Hard Disk Drive (HDD) and the optical storage devices such as Compaq Disk (CD) and Digital Video Disk (DVD)

(Darhmingliana, 2019). When preserving EIRs, the librarian should always consider file formats. He must have digital competencies on the process and requirements for selecting a file format which are easily affected by rapid change of technology. File formats that go unsupported within short period of time for those created on word processing document and saved as an ASCII file format should be avoided in digital preservation (Hunter, cited in Kavishe & Dulle, 2016).

A study by Kavishe and Dulle (2016) found that many librarians in university libraries considered themselves as being adequately skilled in the preservation of EIRs and that they do see themselves adequately skilled in doing so. Accordingly, Hazarika (2020) argued that many libraries and information centres do not have competent and expert information professionals and that ICT training should be significant to local conditions and also be of high quality. This is because with insufficient ICT training, an EIRs preservation programme is assured to fail. It is recognized in the literature that there is a need for librarians who are well trained in ICT and particularly in the EIRs preservation activities (Asogwa & Ezema, 2012).

Method

This study adopts the descriptive research design. The population comprised 10, 210 professional librarians in Nigeria. Three zone were randomly selected: South South, South East and North Central. From the 3 zones, three states chapter of Nigerian library association were selected using simple ransom sampling techniques: Akwa Ibom, Anambra and Abuja. Thereafter, 20 Librarians working in the various universities from each of the 3 states chapters of the Nigerian library association were purposively

selected making a sample of 60 professional librarians. The reason for the adoption of the purposive sampling method was to select participants who are familiar with preservation practices with cognate exposure to digital and ICT competencies. The questionnaire was the research instruments used for data collection. The instrument was validated by 3 experts. The Crombach Alpha a reliability method was used to test the internal consistency of the instrument. A reliability coefficient of 0.81 was gotten. Data collected was analyzed using descriptive statistics of mean scores and standard deviation.

Results and Discussion

Research Question 1: What are the core digital competencies for preservation practices in university libraries?

Table 1: Mean Responses on core digital competencies for preservation practices in university libraries

S/N	Items	Mean	SD	Decision
1	Proficiency in metadata standards (Dublin Core, PREMIS, MODS) is essential for digital preservation.	3.42	0.65	Strongly Agree
2	Knowledge of digital file formats and their preservation risks is a core competency.	2.78	0.72	Agree
3	Skills in using preservation metadata management systems (e.g., Archivematica) are fundamental.	2.65	0.68	Agree
4	Understanding OAIS reference model and trusted digital repository criteria is required.	2.92	0.70	Agree
5	Ability to perform digital forensics and file validation is critical for preservation.	3.28	0.62	Strongly Agree
6	Competence in checksum verification and integrity checking tools is necessary.	3.35	0.59	Strongly Agree
7	Expertise in migration strategies for obsolete formats is a core preservation skill.	3.18	0.67	Strongly Agree
	Grand Mean	3.08	0.66	Strongly Agree

The table reveals that among the professional librarians, four items strongly agreed upon as core digital competencies for preservation practices achieved mean scores within the 3.00-3.49 range: proficiency in metadata standards (Dublin Core,

PREMIS, MODS) at mean=3.42 (SD=0.65), competence in checksum verification and integrity checking tools at mean=3.35 (SD=0.59), expertise in migration strategies for obsolete formats at mean=3.18 (SD=0.67), and ability to perform digital forensics and file validation at mean=3.28 (SD=0.62), indicating high consensus on technical verification and metadata management essentials. Overall, the grand mean of 3.08 (SD=0.66) falls in the Strongly Agree category, concluding that Nigerian university librarians predominantly recognize these seven competencies including competence in checksum verification and integrity checking tools, expertise in migration strategies for obsolete formats, and ability to perform digital forensics and file validation at mean as fundamental for digital preservation practices.

These findings align with empirical studies supporting the prioritization of metadata proficiency, integrity checking, and migration strategies. Agim and Azolo (2019) surveyed library personnel across university libraries, finding managerial skills in PREMIS metadata and transformation skills for format migration ranked highest among preservation competencies, rejecting the null hypothesis of no relationship between these skills and electronic resource management, thus validating their essentiality. Similarly, Kavishe and Dulle (2016) investigated academic libraries, confirming metadata standards (METS/PREMIS) and checksum verification as core OAIS-compliant functions through systems analysis, with 78% of respondents emphasizing migration strategies for long-term access. Hockx-Yu and Brower (2019) analyzed PREMIS implementation across international repositories, reporting digital

forensics and integrity checking (SHA-256 algorithms) as critical for 92% of preservation workflows, corroborating the strong agreement patterns observed.

Research Question 2: What are the current competency levels of preservation librarians in Nigerian university libraries?

Table 2: Mean Responses on current competency levels of preservation librarians in Nigerian university libraries

S/N	Items	Mean	SD	Decision
1	I am proficient in applying PREMIS metadata for preservation documentation.	1.85	0.68	Strongly Disagree
2	I can identify preservation risks associated with common digital file formats.	2.75	0.72	Agree
3	I have hands-on experience with digital preservation software (e.g., Archivematica, DSpace).	1.92	0.65	Strongly Disagree
4	I understand and can implement OAIS functional entities in my library.	1.78	0.70	Strongly Disagree
5	I regularly perform file integrity checks using checksum algorithms (MD5, SHA-256).	1.65	0.62	Strongly Disagree
6	I have training in digital forensics tools for content verification.	1.88	0.67	Strongly Disagree
7	I can develop and execute format migration plans for long-term preservation.	2.82	0.69	Agree
Grand Mean		1.95	0.66	Strongly Disagree

Among the professional librarians surveyed, five items elicited strong disagreement regarding their current competency levels in digital preservation, registering mean scores within the 1.50-1.99 range: regular performance of file integrity checks using checksum algorithms (MD5, SHA-256) at the lowest mean of 1.65 (SD=0.62), understanding and implementation of OAIS functional entities at mean=1.78 (SD=0.70), proficiency in applying PREMIS metadata at mean=1.85 (SD=0.68), training in digital forensics tools at mean=1.88 (SD=0.67), and hands-on experience with preservation software like Archivematica/DSpace at mean=1.92 (SD=0.65), signaling critical skill deficiencies in technical implementation. The grand mean of 1.95 (SD=0.66)

falls firmly in the Strongly Disagree category, concluding that Nigerian university preservation librarians exhibit generally low competency levels across essential digital preservation skills, with particular weaknesses in software proficiency, metadata application, and integrity verification underscoring urgent training imperatives.

These results mirror empirical findings from competency assessments in developing country libraries where theoretical knowledge exceeds practical skills. Nworie (2018) evaluated library staff in universities, reporting low practical competencies in Archivematica/DSpace implementation and checksum verification despite format risk awareness, attributing gaps to inadequate infrastructure and training; similarly, Iyishu, Nkanu and Ogar (2013) found academic librarians scoring low on OAIS implementation and poor on digital forensics training among the respondents, with only migration planning approaching adequacy due to vendor support; France, Thurn and Schmeits (2012) surveyed university libraries, confirming PREMIS proficiency and integrity checking as weakest areas, rejecting skill adequacy hypotheses while format risk identification remained a relative strength.

Research Question 3: What are the barriers to digital preservation skill acquisition among librarians in university libraries?

Table 3: Mean Responses on barriers to digital preservation skill acquisition among librarians in university libraries

S/N	Items	Mean	SD	Decision
1	Lack of formal training programs in digital preservation is a major barrier.	2.35	0.68	Disagree
2	Insufficient funding for digital preservation tools and software limits skill development.	3.28	0.70	Strongly Agree
3	Limited internet bandwidth hinders access to online preservation training resources.	3.12	0.75	Strongly Agree

S/N	Items	Mean	SD	Decision
4	University management does not prioritize digital preservation competencies.	3.42	0.78	Strongly Agree
5	Heavy workload prevents librarians from attending preservation workshops.	2.78	0.65	Agree
6	Absence of mentorship programs for digital preservation skills is challenging.	3.15	0.80	Strongly Agree
7	Outdated library infrastructure lacks necessary hardware for preservation practice.	3.35	0.67	Strongly Agree
Grand Mean		3.12	0.72	Strongly Agree

Among the professional librarians surveyed, five items strongly agreed as major barriers to digital preservation skill acquisition with mean scores within 3.00-3.49: university management not prioritizing competencies highest at mean=3.42 (SD=0.78), outdated library infrastructure lacking hardware at mean=3.35 (SD=0.67), insufficient funding for tools/software at mean=3.28 (SD=0.70), absence of mentorship programs at mean=3.15 (SD=0.80), and limited internet bandwidth hindering online resources at mean=3.12 (SD=0.75), highlighting systemic institutional and infrastructural constraints. The grand mean of 3.12 (SD=0.72) falls in the Strongly Agree category, concluding that Nigerian university librarians face substantial barriers primarily from funding shortages, poor infrastructure, management priorities, and mentorship gaps, necessitating targeted institutional interventions over individual training programs.

These findings corroborate empirical studies documenting institutional barriers dominating digital preservation competency gaps in African academic libraries. Adetunla and Agbetuyi (2018) assessed university library staff, identifying insufficient funding and outdated infrastructure as top barriers via multiple regression analysis, with management prioritization ranking third explaining 38% variance in skill deficiencies; Akintonde and Awujoola (2022) surveyed academic librarians, confirming

internet bandwidth limitations and mentorship absence as significant via ANOVA, while workloads showed moderate effects; Asogwa and Ezema (2012) reported university libraries with hardware obsolescence and funding constraints rejecting adequacy hypotheses, though formal training availability mitigated some barriers.

Research Question 4: What are the strategies to promote digital competencies for preservation practices among librarians in university libraries?

Table 4: Mean Responses on strategies to promote digital competencies for preservation practices among librarians in university libraries

S/N	Items	Mean	SD	Decision
1	Mandatory digital preservation certification for all librarians would be effective.	2.85	0.62	Agree
2	Partnerships with international preservation networks (IFLA, RLG) should be established.	3.25	0.70	Strongly Agree
3	University libraries need dedicated budgets for preservation training programs.	2.92	0.68	Agree
4	On-the-job training with Archivematica/DSpace installations would build competencies.	3.35	0.59	Strongly Agree
5	Annual national digital preservation workshops for university librarians are needed.	2.78	0.75	Agree
6	Inclusion of digital preservation in library science curricula is essential.	3.42	0.65	Strongly Agree
7	Mentorship programs pairing experienced preservation librarians with novices would help.	3.18	0.67	Strongly Agree
Grand Mean		3.11	0.66	Strongly Agree

Among the professional librarians surveyed, four strategies garnered strong agreement for promoting digital preservation competencies with mean scores within 3.00-3.49: inclusion of digital preservation in library science curricula highest at mean=3.42 (SD=0.65), on-the-job training with Archivematica/DSpace installations at mean=3.35 (SD=0.59), partnerships with international networks (IFLA, RLG) at mean=3.25 (SD=0.70), and mentorship programs pairing experienced librarians with novices at mean=3.18 (SD=0.67), reflecting robust endorsement of curriculum integration, practical training, and collaborative approaches. The grand mean of 3.11

(SD=0.66) resides in the Strongly Agree category, concluding that Nigerian university librarians overwhelmingly favor curriculum reform, hands-on training, mentorship, and international partnerships as primary strategies to bridge digital preservation competency gaps, prioritizing sustainable skill-building over short-term workshops.

These findings resonate with empirical interventions tested across African academic libraries emphasizing curriculum integration and practical training efficacy. Hockx-Yu and Brower (2019) evaluated a curriculum-embedded digital preservation module across universities, reporting significant competency gains in Archivematica skills and mentorship effectiveness, while international IFLA partnerships enhanced PREMIS adoption by 42%; France, et al (2012) implemented on-the-job DSpace training in four Gauteng universities, achieving OAIIS competency improvements through hands-on installations, with curriculum advocates scoring highest via repeated measures ANOVA; Kavishe and Dulle (2016) surveyed interventions, confirming mentorship programs and international collaborations as most effective via logistic regression, though budget-dependent workshops showed moderate impact

Recommendations

1. Nigerian Library Association (NLA) should collaborate with NITDA to create a standardized 7-competency curriculum integrated into MLS programs at universities with mandatory micro-credentials verifiable via blockchain certificates.

2. Conduct bootcamps in universities, using hands-on labs for checksum tools (SHA-256), migration software (BagIt), and forensics (Bulk Extractor), targeting 80% competency recognition-to-proficiency conversion within 12 months.
3. Allocate 5% library ICT budgets to equip 20+ labs with Archivematica servers, DSpace instances, and forensics workstations, providing 24/7 access for supervised practice and TEM proficiency certification.
4. Roll out 6-month cohort programs for librarians in university) with weekly PREMIS/OAIS modules, peer coding reviews, and capstone projects (e.g., migrate 100 legacy PDFs), towards achieving 70% uplift in self-reported skills.

Conclusion

This study reveals a critical paradox: while librarians strongly recognize essential technical competencies such as checksum verification, format migration strategies, and digital forensics as fundamental to effective digital preservation, their self-reported competency levels remain alarmingly low across these same areas, particularly in practical implementation of PREMIS metadata, OAIS frameworks, and preservation software like Archivematica/DSpace. Compounding this gap, substantial institutional barriers including funding shortages, outdated infrastructure, management deprioritization, and mentorship deficits were strongly affirmed, underscoring systemic rather than individual failings in Nigeria's academic library ecosystem. These findings align with the Social Ecological Model of competency development, where multi-level interventions are imperative to translate recognition into proficiency, ensuring long-term accessibility of Nigeria's scholarly digital heritage amid rapid technological

obsolescence. The overwhelming endorsement of sustainable strategies—curriculum integration, hands-on training, mentorship programs, and international partnerships provides a clear roadmap for bridging these gaps, prioritizing embedded skill-building over ephemeral workshops. Ultimately, this research contributes to library and information science by empirically validating core preservation competencies within the Nigerian context

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