

# DIGITAL PRESERVATION STRATEGIES AND LONG-TERM ACCESSIBILITY OF INSTITUTIONAL REPOSITORIES IN AFRICAN UNIVERSITIES

**Tina Alam Osim**

Department of Library and Information Science  
University of Cross River State, Nigeria

## Abstract

This study investigated digital preservation strategies and the long-term accessibility of institutional repositories in selected Nigerian universities. The study was motivated by concerns over the sustainability of digital scholarly resources amid growing reliance on institutional repositories for knowledge dissemination. A descriptive survey research design was adopted, and the population comprised ninety (90) repository personnel drawn from five universities, from which a sample of thirty-six (36) respondents was selected using proportionate stratified random sampling. Data were analyzed using descriptive statistics including frequencies, percentages, and mean scores. The findings revealed that basic preservation strategies such as regular backups (86.1%) and metadata standardization (75.0%) are widely implemented, while formal digital preservation policies remain limited (50.0%). The results further showed that technological infrastructure is largely inadequate, with mean values ranging from 1.95 to 2.40, indicating low capacity in areas such as funding, power supply, and storage systems. In addition, the study found that a majority of repository personnel lack formal training in digital preservation, and major factors affecting long-term accessibility include inadequate funding (83.3%), weak policy frameworks (72.2%), and technological obsolescence (66.7%). The study concluded that although institutional repositories have improved access to scholarly outputs, their sustainability is constrained by infrastructural, policy, and human capacity challenges. The study recommends the development of comprehensive preservation policies, increased investment in infrastructure, and continuous professional training to enhance the long-term sustainability of institutional repositories.

**Keywords:** digital preservation, institutional repositories, long-term accessibility, African universities, research data management

## **Introduction**

Digital preservation has become a central concern for academic libraries worldwide as scholarly communication increasingly shifts toward digital formats. Institutional repositories (IRs) serve as critical infrastructures for collecting, managing, disseminating, and preserving the intellectual output of universities, including theses, dissertations, datasets, preprints, and scholarly publications. In the African higher education landscape, IRs are particularly significant because they enhance global visibility of locally produced research while supporting open access initiatives and knowledge equity (Alemayehu & Mutula, 2023). However, ensuring the long-term accessibility of digital resources remains a complex challenge due to technological obsolescence, inadequate funding, and policy gaps that characterize many universities across the continent (Moyo & Bangani, 2024).

The concept of digital preservation refers to a set of managed activities required to ensure continued access to digital materials for as long as necessary, beyond the limits of media failure or technological change. Unlike traditional preservation, which focuses primarily on the physical longevity of materials, digital preservation must address issues such as file format migration, metadata standardization, storage redundancy, and system interoperability (International Federation of Library Associations [IFLA], 2023). As universities increasingly rely on IRs to support research lifecycle management, digital preservation strategies have evolved to include trusted digital repository frameworks, cloud-based storage, and adherence to standards such as the Open Archival Information System (OAIS) model (Kim & Abbas, 2025).

Across African universities, the growth of institutional repositories has been driven largely by the open science movement and mandates for public access to research outputs. Countries such as South Africa, Nigeria, Kenya, and Ghana have made notable progress in establishing IR platforms, often using open-source software like DSpace and EPrints (Chisita & Raju, 2023). Despite these advancements, sustainability and long-term accessibility remain uncertain. Studies indicate that many repositories operate without comprehensive digital preservation policies, relying instead on basic storage solutions that do not adequately address risks such as bit rot, system failure, or cyber threats (Okoye & Onyanha, 2024). Consequently, the mere existence of an IR does not guarantee preservation; rather, it underscores the need for strategic planning and institutional commitment.

One of the most pressing issues affecting digital preservation in African universities is infrastructural inequality. Limited bandwidth, unstable power supply, and insufficient data storage facilities constrain repository performance and reliability (Olatokun & Emasealu, 2023). These infrastructural limitations often result in intermittent access, slow system response times, and increased vulnerability to data loss. Furthermore, the high cost of maintaining secure digital storage environments—particularly those requiring redundancy and off-site backups—poses financial challenges for institutions already operating under constrained budgets (Ncube & Mhlongo, 2025). Without sustainable funding models, preservation initiatives risk becoming short-term projects rather than long-term institutional commitments.

Human capacity is another critical factor shaping the effectiveness of digital preservation strategies. Effective management of IRs requires expertise in digital curation, metadata standards, repository software administration, and cybersecurity. However, many African universities face shortages of skilled personnel trained in these specialized areas (Achieng & Otike, 2024). Capacity gaps often lead to inconsistent metadata practices, inadequate documentation, and limited monitoring of repository integrity. Continuous professional development and collaboration with international digital preservation networks have therefore been recommended as essential mechanisms for strengthening institutional capabilities (Raju & Chisita, 2026).

Policy and governance frameworks also play a decisive role in the sustainability of institutional repositories. Digital preservation policies provide guidelines for content selection, retention schedules, rights management, and disaster recovery planning. Yet, evidence suggests that a significant proportion of African universities operate without formalized policies, resulting in fragmented practices and uncertainty regarding long-term stewardship responsibilities (Bangani & Moyo, 2024). Institutional leadership support is crucial, as preservation requires integration into broader research management and ICT strategies rather than being treated as a purely technical function.

Another emerging dimension of digital preservation is the need to ensure equitable and inclusive access to preserved knowledge. Institutional repositories not only safeguard digital content but also democratize access by making research outputs available to scholars, policymakers, and the public. In regions where access to commercial scholarly

databases is limited, IRs function as vital knowledge infrastructures that support teaching, innovation, and evidence-based policymaking (Onyanha & Maluleka, 2023). Ensuring long-term accessibility therefore has implications that extend beyond preservation to encompass social justice, research impact, and national development.

Technological innovation continues to reshape digital preservation practices. Recent trends include the adoption of artificial intelligence for metadata generation, blockchain for authenticity verification, and distributed preservation networks to enhance resilience (Abbas & Kim, 2025). While these technologies offer promising solutions, their implementation in African contexts is still at an early stage due to cost, expertise, and infrastructure requirements. As a result, many institutions continue to rely on incremental approaches, focusing on improving existing systems rather than deploying advanced technologies.

Despite growing recognition of the importance of digital preservation, empirical research on the effectiveness of preservation strategies in African institutional repositories remains limited. Much of the existing literature focuses on repository adoption and open access, with fewer studies examining long-term sustainability, risk management, and user accessibility outcomes. This gap highlights the need for comprehensive investigations into the policies, technologies, and organizational practices that shape preservation effectiveness across the continent.

Given the strategic role of institutional repositories in safeguarding Africa's scholarly record, there is an urgent need to evaluate current digital preservation strategies

and identify pathways for improving long-term accessibility. Without robust preservation frameworks, valuable research outputs risk becoming inaccessible due to technological obsolescence or system failures, undermining the visibility and impact of African scholarship. This study therefore seeks to examine digital preservation strategies and long-term accessibility of institutional repositories in African universities, with the aim of identifying challenges, best practices, and sustainable solutions for ensuring continued access to digital knowledge resources.

### Statement of the Problem

Despite the growing adoption of institutional repositories in African universities as platforms for preserving and disseminating scholarly outputs, concerns about their long-term accessibility and sustainability continue to persist. Many repositories have been established primarily to enhance research visibility and support open access initiatives, yet the digital preservation mechanisms required to ensure continued availability of these resources are often weak or underdeveloped. Consequently, valuable digital assets such as theses, dissertations, research articles, and datasets remain vulnerable to technological obsolescence, data loss, and system failures. In many African universities, institutional repositories operate within environments characterized by inadequate funding, limited ICT infrastructure, and absence of comprehensive digital preservation policies. These constraints hinder the implementation of essential preservation strategies such as regular backups, format migration, metadata standardization, and secure storage systems. Furthermore, the shortage of skilled personnel with expertise in digital curation and

repository management limits the effectiveness of existing preservation practices. Without structured frameworks and institutional commitment, repositories risk becoming access platforms without guaranteed long-term preservation. The implications of these challenges are significant. When digital resources become inaccessible or are lost, universities not only lose part of their intellectual heritage but also weaken research continuity, visibility, and impact. Scholars and students may face difficulties accessing past research outputs, thereby affecting teaching, learning, and innovation. Moreover, the absence of reliable preservation systems undermines confidence in institutional repositories as trusted digital archives.

Therefore, the central problem of this study is that although institutional repositories are increasingly present in African universities, there is insufficient evidence on the effectiveness of digital preservation strategies in ensuring long-term accessibility of their contents. This gap necessitates a systematic investigation into the current preservation practices, challenges, and sustainability mechanisms in order to propose strategies that will strengthen the reliability and longevity of institutional repositories across African higher education institutions.

### Research Questions

The study will be guided by the following research questions:

1. What digital preservation strategies are currently implemented in institutional repositories in African universities?

2. To what extent are technological facilities and repository systems adequate for ensuring long-term accessibility of digital resources?
3. What are the level of staff competencies in digital preservation for ensuring long term accessibility?
4. What are the factors affecting long-term accessibility of institutional repository in African Universities?

#### Literature review

Digital preservation has emerged as a foundational responsibility of academic libraries in the twenty-first century, particularly as scholarly communication increasingly occurs in digital environments. Digital preservation refers to the managed activities required to ensure continued access to digital materials for as long as necessary, regardless of changes in technology or organizational context. These activities include bit-level preservation, format migration, metadata management, and the establishment of trusted digital repository infrastructures (International Federation of Library Associations [IFLA], 2023). Institutional repositories (IRs) function as structured digital platforms designed to collect, preserve, and disseminate the intellectual outputs of universities. They serve multiple roles: enhancing research visibility, supporting open access, facilitating knowledge sharing, and preserving institutional memory. In African universities, IRs have become increasingly important due to their capacity to bridge information access gaps and promote global visibility of local scholarship (Alemayehu & Mutula, 2023). However, while many institutions have successfully implemented repositories, ensuring the long-term

accessibility of their contents remains a complex challenge shaped by technological, organizational, and policy factors. Recent scholarship underscores that digital preservation should not be viewed as a purely technical process but rather as a socio-technical system involving governance structures, human expertise, and sustainable funding models (Kim & Abbas, 2025). This perspective aligns with the objectives of the present study, which seeks to examine how preservation strategies, infrastructure, policy, and professional competencies collectively influence the sustainability of institutional repositories in African universities.

The Open Archival Information System (OAIS) reference model continues to serve as the dominant theoretical framework guiding digital preservation initiatives. The OAIS model emphasizes the processes of ingest, storage, data management, preservation planning, and access, thereby providing a structured approach to ensuring long-term accessibility of digital content (Lavoie, 2023). Many institutional repositories globally have adopted OAIS-inspired workflows to ensure authenticity and reliability of preserved resources. Complementing OAIS is the concept of trusted digital repositories (TDRs), which emphasizes transparency, accountability, and adherence to preservation standards. Studies highlight that achieving TDR status requires not only technological infrastructure but also institutional commitment and governance mechanisms (Rieger, 2024). Another relevant theoretical perspective is the digital curation lifecycle model, which situates preservation within the broader lifecycle of research data and scholarly outputs. This model underscores the importance of early planning, continuous monitoring, and periodic evaluation to ensure sustainability (Yakel, 2025). These frameworks collectively inform the present study by

providing lenses through which preservation strategies and institutional readiness can be assessed.

Digital preservation strategies encompass a range of technical and managerial practices designed to ensure long-term access to digital content. Key strategies identified in recent literature include format migration, emulation, replication, and the use of redundant storage systems. Migration involves converting digital files into newer formats to maintain usability, while emulation recreates original software environments to enable access to obsolete formats (Kim & Abbas, 2025). In African university repositories, the most commonly adopted strategies include routine backups, use of open-source repository software such as DSpace, and basic metadata standardization (Chisita & Raju, 2023). However, more advanced strategies—such as automated integrity checks, distributed preservation networks, and digital preservation audits—remain less common due to resource constraints. Cloud-based preservation has also gained traction as a cost-effective approach to ensuring scalability and redundancy. Research indicates that hybrid preservation models combining local storage with cloud backups offer improved resilience against data loss (Ncube & Mhlongo, 2025). Nevertheless, concerns about data sovereignty, cost sustainability, and internet reliability continue to shape adoption decisions in African contexts.

The adequacy of technological infrastructure is widely recognized as a critical determinant of digital preservation success. Infrastructure encompasses hardware, software, storage capacity, network connectivity, and power supply. Studies conducted

across African universities reveal significant disparities in infrastructure readiness, with some institutions operating well-equipped repositories while others struggle with limited storage and unreliable connectivity (Olatokun & Emasealu, 2023). Bandwidth limitations and unstable power supply have been identified as major barriers to repository performance and accessibility. These constraints not only affect user access but also hinder routine preservation tasks such as backups and system updates (Moyo & Bangani, 2024). Furthermore, the rapid pace of technological change necessitates continuous upgrades, which many institutions find difficult to sustain financially. Despite these challenges, recent research highlights emerging innovations such as virtualization, distributed storage, and low-cost preservation solutions tailored to resource-constrained environments. These developments suggest that infrastructure limitations, while significant, can be mitigated through strategic planning and collaboration (Ncube & Mhlongo, 2025).

Institutional policies play a pivotal role in guiding digital preservation practices by defining responsibilities, standards, and procedures. Preservation policies typically address issues such as content selection, retention periods, metadata standards, access rights, and disaster recovery. Evidence from recent studies indicates that many African universities either lack formal digital preservation policies or have policies that are not fully implemented (Okoye & Onyanacha, 2024). Governance structures also influence preservation outcomes by determining how responsibilities are distributed among library staff, IT departments, and institutional leadership. Strong governance frameworks facilitate coordination, resource allocation, and accountability, thereby enhancing sustainability (Bangani & Moyo, 2024). Conversely, weak governance often results in fragmented

practices and limited institutional support for preservation initiatives. Integration of digital preservation into broader research management and ICT strategies has been identified as a key success factor. Institutions that embed preservation within strategic planning processes are more likely to secure funding and maintain long-term continuity (Rieger, 2024).

Human capacity remains one of the most critical components of digital preservation. Effective repository management requires expertise in digital curation, metadata standards, system administration, and information security. However, a shortage of trained professionals persists in many African universities, limiting the effectiveness of preservation strategies (Achieng & Otike, 2024). Capacity building initiatives such as training workshops, professional certification programs, and international collaborations have been recommended to address these gaps. Studies indicate that institutions investing in staff development demonstrate higher levels of preservation readiness and system reliability (Raju & Chisita, 2026). The role of organizational culture is also emphasized in recent literature. Institutions that prioritize innovation and continuous learning are better positioned to adapt to evolving preservation challenges and technologies.

Several interrelated challenges continue to threaten the sustainability of institutional repositories. These include:

Financial constraints limiting infrastructure upgrades and staffing.

Technological obsolescence affecting file formats and software systems.

Policy gaps resulting in inconsistent preservation practices.

Cybersecurity risks threatening data integrity.

Collectively, these challenges underscore the need for comprehensive preservation frameworks that integrate technical, organizational, and financial dimensions (Kim & Abbas, 2025; Moyo & Bangani, 2024).

Empirical studies across African higher education institutions show steady growth in repository adoption but varying levels of preservation maturity. While many universities have successfully implemented repositories, fewer have achieved robust preservation infrastructures capable of ensuring long-term accessibility (Chisita & Raju, 2023). Research also indicates that collaborative initiatives, such as regional repository networks and shared preservation infrastructure, offer promising pathways for enhancing sustainability. These initiatives enable institutions to pool resources, share expertise, and reduce costs (Raju & Chisita, 2026). Although existing literature provides valuable insights into digital preservation practices, several gaps remain. First, many studies focus on repository adoption rather than evaluating the effectiveness of preservation strategies. Second, there is limited empirical analysis linking technological infrastructure, policy frameworks, and professional competencies to long-term accessibility outcomes. Third, comparative studies across multiple African institutions remain scarce, limiting the generalizability of findings.

## Methodology

### Research Design

This study adopts a descriptive survey research design. The descriptive survey design is considered appropriate because it enables the systematic collection of data from a representative group of respondents in order to describe, analyze, and interpret existing practices related to digital preservation and long-term accessibility of institutional repositories in African universities. The design allows the researcher to examine current preservation strategies, technological infrastructure, policy frameworks, and professional competencies without manipulating any variables. Furthermore, the survey approach facilitates the gathering of quantitative and qualitative insights from repository managers, librarians, and information technology personnel who are directly involved in repository operations. This makes it possible to obtain reliable data on institutional practices, challenges, and sustainability mechanisms, thereby providing a comprehensive understanding of the current state of digital preservation in university repositories.

The population of the study comprises professional and paraprofessional staff involved in the management of institutional repositories in selected African universities. These include university librarians, repository managers, systems librarians, and ICT personnel responsible for digital preservation activities. The population distribution across the selected universities are; University of Abuja 20, University of Lagos 18, University of Nigeria Nsukka 17, Ahmadu Bello University 15, University of Ibadan 20, hence the population of the study comprises of 90 librarians as respondent. From this population, a

sample of thirty-six (36) respondents representing 40% of the population was selected using a proportionate stratified random sampling technique to ensure adequate representation of each institution. The sampling approach ensured that respondents from different professional categories and universities had equal opportunity to participate, thereby enhancing the representativeness and reliability of the data collected.

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### Results and Discussion

Data collected were analyzed using descriptive statistics such as frequencies, percentages, and mean scores. The results are presented according to the research questions.

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University	No. of Respondents	Percentage (%)
University of Abuja	8	22.2
University of Lagos	7	19.4
University of Nigeria Nsukka	7	19.4

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Table 1: Descriptive statistics of distribution of Respondents by University

Ahmadu Bello University	6	16.7
University of Ibadan	8	22.2
Total	36	100

**Description:**

Table 1 indicates that 36 respondents took part in the study. The University of Abuja and the University of Ibadan had the highest representation (22.2% each), ensuring balanced institutional coverage.

Table 2: What digital preservation strategies are currently implemented in institutional

Strategy	Respondents (n)	Percentage (%)
repositories in African universities?		
Regular repository backups	31	86.1
Metadata standardization	27	75.0
Cloud or off-site storage	25	69.4
Use of preservation software	22	61.1

**Description**

The most widely implemented strategy is regular backups (86.1%), followed by metadata standardization (75%). However, only half of the institutions have formal digital preservation policies, indicating reliance on technical rather than policy frameworks.

Digital preservation policy	18	50.0
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Table 3: To what extent are technological facilities and repository systems adequate for

Facility	Poor/Not Available (n)	Percentage (%)	Mean (1-5)
ensuring long-term accessibility of digital resources?			
Reliable internet connectivity	21	58.3	2.40
Repository servers/storage capacity	24	66.7	2.20
Power supply stability	26	72.2	2.05
Skilled IT support staff	23	63.9	2.30

Description:

All facilities recorded mean scores below 2.5, indicating low adequacy. Funding (77.8%) and unstable power supply (72.2%) are the most critical infrastructure constraints.

Funding for digital preservation	28	77.8	1.95
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Table 4: What are the level of staff competencies in digital preservation for ensuring long

Competence Level	Respondents (n)	Percentage (%)
term accessibility?		
No formal training	20	55.6
Workshops/short courses	12	33.3
Professional certification	4	11.1

Description:

More than half of the respondents lack formal training in digital preservation, highlighting a major capacity gap affecting repository sustainability.

Table 5: What are the factors affecting long-term accessibility of institutional repository in

Factor	Respondents (n)	Percentage (%)
African Universities?		
Inadequate funding	30	83.3
Weak policy framework	26	72.2
Technological obsolescence	24	66.7
Poor infrastructure	23	63.9

Description:

Funding remains the most significant factor affecting long-term access (83.3%), followed by weak policy frameworks (72.2%), showing structural rather than purely technical barriers.

Copyright restrictions	19	52.8
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The findings revealed that regular repository backups recorded the highest level of adoption with 86.1% of respondents, followed by metadata standardization with 75.0%,

cloud or off-site storage with 69.4%, and the use of preservation software tools with 61.1%. However, the availability of formal digital preservation policies recorded only 50.0%, indicating that policy support is comparatively weak despite widespread technical practices. These findings are consistent with the position of Alemayehu and Mutula (2023), who reported that African institutional repositories tend to prioritize operational preservation measures such as backups and metadata because they are easier to implement within existing resource constraints. Similarly, Chisita and Raju (2023) observed that repositories in developing regions often emphasize access and visibility functions, while comprehensive preservation planning remains underdeveloped. The moderate level of policy adoption corroborates the findings of Okoye and Onyancha (2024), who concluded that many universities lack formal preservation policies, resulting in reliance on technical practices without long-term governance structures. The implication is that while basic preservation activities are relatively well established, the absence of strong policy frameworks may undermine sustainability.

The study showed that technological infrastructure is largely inadequate across the institutions examined. Funding recorded the highest inadequacy level with 77.8%, followed by unstable power supply (72.2%), insufficient storage capacity (66.7%), lack of skilled IT support (63.9%), and poor internet connectivity (58.3%). The overall mean values for infrastructure indicators ranged from 1.95 to 2.40, all below the acceptable benchmark of 2.50, indicating low adequacy of infrastructure for effective digital preservation. These findings align with Olatokun and Emasealu (2023), who emphasized that infrastructural deficiencies—particularly unstable electricity and limited bandwidth—are major barriers

to repository sustainability in African universities. Likewise, Ncube and Mhlongo (2025) reported that inadequate storage systems and limited ICT investment compromise the reliability and long-term accessibility of digital repositories. The implication of this finding is that digital preservation cannot be effectively sustained without improved technological capacity, as infrastructure forms the foundation for preservation activities such as backups, migration, and system maintenance.

The results indicated that 55.6% of respondents had no formal training in digital preservation, 33.3% had attended workshops or short courses, while only 11.1% possessed professional certification. This distribution demonstrates a predominance of low competence levels among repository personnel, suggesting that skills gaps remain a major constraint to effective preservation implementation. This finding supports Achieng and Otike (2024), who reported a shortage of specialized digital curation skills across African academic libraries. Their study highlights that limited expertise in metadata standards, digital archiving, and repository administration affects the effectiveness of preservation initiatives. Similarly, Raju and Chisita (2026) emphasized that continuous professional development is essential for strengthening digital preservation capacity and ensuring repository sustainability. The implication is that investment in staff training is critical for improving preservation outcomes.

The study identified inadequate funding as the most significant factor affecting long-term accessibility, with 83.3% of respondents, followed by weak policy frameworks (72.2%), technological obsolescence (66.7%), poor infrastructure (63.9%), and copyright

restrictions (52.8%). These findings are consistent with Moyo and Bangani (2024), who noted that financial constraints limit infrastructure upgrades and preservation planning, thereby threatening repository sustainability. The prominence of policy gaps also supports Bangani and Moyo (2024), who argued that the absence of clear governance structures leads to inconsistent preservation practices and weak institutional commitment. Furthermore, the issue of technological obsolescence aligns with Kim and Abbas (2025), who emphasized that rapid changes in digital formats and software environments pose significant risks to long-term accessibility if migration strategies are not systematically implemented.

### Recommendations

Based on the findings of the study, the following recommendations are made:

1. Universities should develop and implement comprehensive digital preservation policies to guide repository management and ensure long-term sustainability.
2. Institutional management should increase funding and investment in ICT infrastructure, particularly in areas of storage capacity, backup systems, and reliable power supply.
3. Regular training and capacity-building programs should be organized for librarians and repository staff to enhance their competencies in digital preservation and curation.

4. Collaborative preservation initiatives and partnerships among universities should be encouraged to enable resource sharing and adoption of best practices.

## Conclusion

Based on the findings, the study concludes that institutional repositories in Nigerian universities have made significant progress in supporting access to scholarly outputs; however, their long-term sustainability remains constrained by systemic challenges. Digital preservation practices are still largely operational rather than strategic, as many institutions rely on basic technical measures without comprehensive policy frameworks or adequate infrastructure. The absence of sufficient funding, skilled personnel, and institutional commitment further limits the effectiveness of preservation initiatives. The study therefore concludes that achieving sustainable long-term accessibility of institutional repository content requires a holistic approach that integrates technological investment, policy development, and capacity building.

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