© JUN 2026 | IRE Journals | Volume 9 Issue 12 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/ire1718818

Long-Term Preservation Challenges of Large Language Models and Their Ephemeral Outputs in Archives in South West Nigeria

Dada, Rachael Olufunmilola[1], Adebowale Jeremy Adetayo[2], Akintunde, Ebunoluwa Boluwatife[3], Peter Enamudu[4]

[1, 2, 3, 4] *Babcock University, Ilishan-Remo, Ogun State, Nigeria*

Abstract- ***Archival institutions worldwide are confronting transformative pressures as Large Language Models (LLMs) generate content that challenges established preservation frameworks. This study examined the long-term preservation challenges of LLMs and their ephemeral outputs in archival institutions in South West Nigeria. A descriptive survey design was adopted, and structured questionnaires were administered to 71 archival and information management professionals drawn from National Archives, state archives, academic institutions, and government agencies across Ogun, Oyo, Lagos, and Ekiti States. Findings reveal that while awareness of LLM technologies is high (93%), institutional adoption remains uneven, with 33.8% of institutions never using LLMs. Respondents largely characterise LLM outputs as dynamic, context-dependent, and continuously updated artefacts. A majority (59.2%) conditionally recognise these outputs as official records, with recognition contingent on usage context. Key preservation challenges identified include unstable power supply and poor internet connectivity (M = 3.17), lack of technical expertise (M = 3.06), inadequate funding (M = 3.01), and the absence of AI-specific preservation policies (M = 3.01). Although most institutions possess general digital preservation policies, guidelines specifically addressing AI-generated content remain critically underdeveloped, and over half of professionals (56.3%) have not received formal AI preservation training. The study recommends adoption of international preservation standards, targeted capacity building, sustained funding, and integration of AI-generated records into national archival frameworks. These findings advance understanding of digital preservation challenges in emerging archival ecosystems and have direct relevance to archival policy in sub-Saharan Africa.***

Index Terms- ***archives, artificial intelligence, digital preservation, ephemeral outputs, large language models***

I. INTRODUCTION

The rapid proliferation of artificial intelligence has fundamentally altered the information landscape in which contemporary archival institutions operate. Among the most consequential developments is the emergence of Large Language Models (LLMs)—probabilistic text-generation systems such as OpenAI's ChatGPT, Google's Gemini, and Anthropic's Claude—that are increasingly deployed within libraries, archives, and records management centres to automate metadata creation, generate user-service responses, summarise documents, assist policy drafting, and support research activities. Unlike traditional digital objects, whose preservation requirements have been progressively codified through international standards, the outputs of LLMs are inherently dynamic, non-deterministic, context-dependent, and often unrepeatable. This fundamentally ephemeral character places AI-generated content beyond the reach of conventional preservation frameworks, demanding urgent theoretical and practical reconsideration.

Digital preservation has long been recognised as a domain of critical institutional responsibility. The exponential growth of digital information has created enormous repositories of knowledge but has simultaneously intensified the risk of data obsolescence, format incompatibility, and irrecoverable loss (Albani & Maggio, 2020; Ubogu et al., 2023). Cultural heritage institutions in particular—archives, libraries, and museums—are custodians of irreplaceable intellectual and documentary heritage, and their capacity to sustain digital materials over time is central to national memory and accountability. For these institutions, the emergence of LLMs introduces a new and poorly understood category of digital object: the AI-generated artefact. Whether automated summaries, AI-drafted policy texts, conversational logs, or algorithmically generated metadata, these outputs occupy an ambiguous ontological position within established records management doctrines. Their legal admissibility, archival legitimacy, and long-term preservation value remain contested.

Existing scholarship has concentrated primarily on the technical infrastructure of digital preservation, reproducibility challenges in machine learning, and governance frameworks for AI accountability (Gebru et al., 2021; Mitchell et al., 2019; Pineau et al., 2021; Raji et al., 2020). Research on the memorisation and extractability of training data from LLMs has further underscored the ethical and legal complexity of preserving AI artefacts (Carlini et al., 2021). At the institutional level, studies in sub-Saharan Africa have documented the precarious state of digital preservation

infrastructure, particularly in government agencies and academic libraries (Areo et al., 2023; Masenya & Ngulube, 2019). However, the intersection of LLM adoption and archival preservation in the specific context of Nigerian archival institutions remains empirically unexplored. It is unknown how archival professionals perceive the record status of AI-generated outputs, what preservation methods are being deployed, and which systemic barriers impede sustainable preservation practice.

Nigeria's South West geopolitical zone houses some of the most historically significant archival repositories in West Africa, including the National Archives of Nigeria (Ibadan), established in 1954 as one of the three principal zonal offices of the National Archives of Nigeria, and responsible for colonial-era and post-independence documentary heritage of the former Western Region. It also encompasses the Lagos State Records and Archives Bureau (LASRAB), the Oyo State Archives and Records Management Centre, and the Ogun State Government Archives, among others. These institutions collectively preserve an immense body of governmental, administrative, and cultural records. As these archives adopt AI-assisted workflows—whether for digitisation, indexing, or public services—the outputs generated by LLMs enter institutional information environments without clear preservation protocols.

The present study addresses this gap directly. It examines the long-term preservation challenges associated with LLM outputs in archival institutions in South West Nigeria, investigates professional awareness and institutional practices, characterises the perceived ephemeral nature of AI-generated content, and identifies the key infrastructural, policy, and capacity challenges that impede sustainable preservation. By providing context-specific empirical evidence, the study contributes to both the theoretical discourse on preserving AI-generated content and the practical development of preservation policies suited to emerging archival ecosystems in sub-Saharan Africa.

A. Objectives of the Study

The general objective of this study was to examine the long-term preservation challenges of LLMs and their ephemeral outputs in archives in South West Nigeria. Specifically, the study sought to:

1. Evaluate current preservation models and frameworks used in archival and information management in National Archives in South West Nigeria;
2. Examine the role and treatment of ephemeral outputs in the digital preservation of archival materials in South West Nigeria;
3. Identify the key challenges associated with long-term digital preservation of LLM outputs in archives in South West Nigeria; and
4. Propose strategies to enhance the sustainability and reliability of long-term preservation systems for AI-generated records in South West Nigeria.

B. Research Questions

RQ1: What preservation models and frameworks are currently employed in managing digital resources in National Archives in South West Nigeria?

RQ2: How are ephemeral LLM outputs perceived and treated in relation to the completeness and authenticity of digital archives in South West Nigeria?

RQ3: What are the main technological, organisational, and financial challenges in the long-term digital preservation of LLM outputs in South West Nigeria?

RQ4: What strategies can improve the preservation of AI-generated records in archival institutions in South West Nigeria?

II. METHODOLOGY

A. Research Design

A descriptive survey research design was adopted for this study. A survey design was considered appropriate because it facilitates the systematic collection of data from a defined population at a single point in time, enabling the description and quantification of phenomena, attitudes, and perceptions across a large sample (Creswell & Creswell, 2018). Given that the study sought to describe professional awareness, institutional practices, and perceived challenges across multiple archival institutions in South West Nigeria, this design provided the most efficient and valid methodological approach.

B. Population and Sample

The target population comprised all archivists, librarians, records managers, ICT/digital preservation officers, and researchers employed in National Archives of Nigeria branches, state archives, academic institutions, government agencies, and affiliated organisations within the South West geopolitical zone of Nigeria. The four states included in the study were Ogun, Oyo, Lagos, and Ekiti. A total of 71 professionals participated in the study through a purposive sampling approach. Purposive sampling was employed to ensure that all participants possessed

direct professional experience relevant to archival and information management, thereby ensuring the substantive validity of the data collected.

C. Instrumentation

Data were collected using a structured questionnaire developed by the researchers based on a review of the relevant literature, including scales and constructs drawn from prior studies on digital preservation practices (Albani & Maggio, 2020; Masenya & Ngulube, 2019), AI governance (UNESCO, 2021), and professional capacity in archival contexts (Areo et al., 2023). The questionnaire comprised two sections: (a) demographic information including gender, age, educational qualification, professional role, years of experience, institutional affiliation, and state location; and (b) substantive items assessing LLM awareness and use, perceptions of LLM output characteristics, institutional preservation infrastructure, challenges to preservation, professional training and capacity, and strategic policy priorities. Challenge items in Section B were presented on a four-point Likert scale ranging from 1 (Strongly Disagree) to 4 (Strongly Agree), with higher scores indicating stronger agreement with the proposed challenge statement.

Content validity was established through expert review by three specialists in information management and digital archiving, whose feedback informed revisions to item wording, clarity, and coverage. The reliability of the Likert-scale items was confirmed through a pilot test with ten professionals not included in the main sample, yielding a Cronbach's alpha coefficient of .82, indicating satisfactory internal consistency.

D. Data Collection and Analysis

Questionnaires were administered in person across participating institutions in Ogun, Oyo, Lagos, and Ekiti States. All 71 distributed questionnaires were returned and found complete, yielding a 100% response rate. Data were analysed using descriptive statistics, including frequencies, percentages, means (M), and standard deviations (SD), computed with the aid of SPSS Version 25. Results are presented sequentially in alignment with the study's research questions.

III. RESULTS

Table 1. *Demographic Characteristics of Respondents (N = 71)*

Variable	Category	Frequency	Percent (%)
Gender	Male	21	29.6
	Female	46	64.8
	Prefer not to say	4	5.6
Age	20–29 years	6	8.5
	30–39 years	15	21.1
	40–49 years	18	25.4
	50 years and above	32	45.1
Highest Qualification	Diploma	9	12.7
	Bachelor's Degree	33	46.5
	Master's Degree	19	26.8
	PhD	10	14.1
Professional Role	Archivist	12	16.9
	Librarian	42	59.2
	Record Manager	4	5.6
	ICT/Digital Preservation Officer	4	5.6
	Researcher	9	12.7
Years of Experience	Less than 5 years	14	19.7
	5–10 years	16	22.5
	11–15 years	16	22.5
	Above 15 years	25	35.2
Institution Type	National Archive	14	19.7
	State Archive	1	1.4
	Academic Institution	18	25.4
	Research Institute	5	7.0
	Government Agency	28	39.4
	Private Organisation	5	7.0
State Location	Ogun	40	56.3
	Oyo	22	31.0
	Lagos	7	9.9
	Ekiti	2	2.8

Table 1 presents the demographic characteristics of the 71 respondents. Female respondents constituted the majority (64.8%), compared with 29.6% male and 5.6% who preferred not to disclose gender, indicating a predominantly female professional workforce in the surveyed institutions. In terms of age, the largest cohort was aged 50 years and above (45.1%), followed by the 40–49 age group (25.4%), suggesting a workforce characterised by seniority and accumulated experience. A total of 70.4% of respondents were aged 40 years or above. With respect to educational attainment, almost half (46.5%) held a Bachelor's degree, with further proportions holding a Master's degree (26.8%) or PhD (14.1%), reflecting a relatively high level of professional qualification. Librarians constituted the largest occupational group (59.2%), followed by archivists (16.9%) and researchers (12.7%). Over half of respondents reported more than 11 years of professional experience (57.7% combined for 11–15 years and above 15 years categories), further affirming the professional expertise of the sample.

Government agencies represented the largest institutional category (39.4%), followed by academic institutions (25.4%) and National Archives (19.7%). Geographically, Ogun State accounted for the highest proportion of respondents (56.3%), followed by Oyo State (31.0%), Lagos (9.9%), and Ekiti (2.8%).

Table 2. *Awareness and Institutional Use of Large Language Models (N = 71)*

Variable	Category	Frequency	Percent (%)
Awareness of LLMs	Yes	66	93.0
	No	5	7.0
Institution Uses LLM-Generated Content	Yes	40	56.3
	No	16	22.5
	Not sure	15	21.1
Primary Purpose of LLM Use	Research assistance	11	15.5
	Metadata creation	10	14.1
	Content summarisation	17	23.9
	Policy drafting	10	14.1
	User services	23	32.4
Frequency of LLM Use	Very frequently	11	15.5
	Frequently	14	19.7
	Occasionally	14	19.7
	Rarely	8	11.3
	Never	24	33.8

Table 2 addresses Research Question 1. Awareness of LLM technologies was very high, with 93.0% of respondents (n = 66) confirming familiarity with tools such as ChatGPT, Gemini, and Claude. However, this awareness does not translate uniformly into institutional adoption: 56.3% reported that their institution uses LLM-generated content, while 22.5% indicated their institutions do not and 21.1% were uncertain. The primary uses of LLMs within participating institutions were user services (32.4%) and content summarisation (23.9%), followed by research assistance (15.5%), metadata creation (14.1%), and policy drafting (14.1%). Notably, more than one third of respondents (33.8%) indicated that LLMs are never used, underscoring an uneven landscape of adoption in which widespread awareness coexists with considerable implementation inertia.

Table 3. *Perceptions of the Nature and Record Status of LLM Outputs (N = 71)*

Variable	Category	Frequency	Percent (%)
Nature of LLM Outputs	Temporary	9	12.7
	Continuously updated	27	38.0
	Context-dependent	20	28.2
	Difficult to reproduce	10	14.1
	All of the above	5	7.0
LLM Outputs Worth Preserving	Research outputs	13	18.3
	Policy documents	6	8.5
	Institutional reports	10	14.1
	Training materials	13	18.3
	All of the above	4	5.6
	None	25	35.2
LLM Outputs as Official Records	Yes	20	28.2
	No	9	12.7
	Depends on usage	42	59.2

Table 3 addresses Research Question 2 on the perceived character and archival status of LLM outputs. The dominant descriptor selected by respondents was 'continuously updated' (38.0%), followed by 'context-dependent' (28.2%), 'difficult to reproduce' (14.1%), and 'temporary' (12.7%). Only 7.0% selected all four options simultaneously. These findings indicate that archival and information management professionals largely understand LLM outputs as dynamic and fluid rather than as fixed, stable artefacts amenable to conventional preservation—a perception consistent with the technical literature on LLM behaviour (Carlini et al., 2021; Pineau et al., 2021).

With respect to preservation value, 35.2% of respondents indicated that no LLM outputs merit preservation. Among those who identified categories of preservation-worthy outputs, research outputs (18.3%) and training materials (18.3%) were cited most frequently, followed by institutional reports (14.1%) and policy documents (8.5%). Only 5.6% endorsed preservation of all categories. Regarding official record status, a clear majority (59.2%) adopted a conditional stance, stating that whether LLM outputs qualify as official records depends on usage context. This functional and value-based framing reflects an emergent but nuanced professional understanding of records as defined by evidential function rather than by mode of creation.

Table 4. *Digital Preservation Practices and Infrastructure (N = 71)*

Variable	Category	Frequency	Percent (%)
Digital Preservation Policy	Yes	42	59.2

Variable	Category	Frequency	Percent (%)
	No	6	8.5
	In development	23	32.4
Guidelines for Preserving AI-Generated Content	Yes	28	39.4
	No	11	15.5
	Not aware	32	45.1
Digital Preservation Methods Used	Cloud storage	11	15.5
	Local server	15	21.1
	External hard drive	11	15.5
	Institutional repository	20	28.2
	Combination (cloud + local)	1	1.4
	None	13	18.3
Adequacy of Preservation Infrastructure	Very adequate	12	16.9
	Adequate	30	42.3
	Inadequate	14	19.7
	Very inadequate	10	14.1
	Unspecified	5	7.0

Table 4 presents findings on institutional digital preservation policies and infrastructure. A majority of institutions (59.2%) reported having a digital preservation policy in place, with a further 32.4% indicating that a policy was under development. Only 8.5% reported having no policy. However, the picture diverges sharply when attention turns specifically to AI-generated content: only 39.4% of respondents confirmed the existence of guidelines for preserving AI-generated materials, while 45.1% indicated unawareness of any such guidelines and 15.5% confirmed their absence. This disparity between general digital preservation policy (91.6% having or developing one) and AI-specific preservation guidelines (39.4% aware of one) represents a critical policy gap.

Regarding preservation methods, institutional repositories were the most commonly used (28.2%), followed by local servers (21.1%), cloud storage (15.5%), and external hard drives (15.5%). Critically, 18.3% reported using no formal digital preservation method. The combined infrastructure adequacy assessment yielded 59.2% reporting adequate or very adequate infrastructure, compared with 33.8% who rated infrastructure as inadequate or very inadequate. These figures, while reflecting moderate preparedness, mask significant variation across institution types and suggest that a substantial minority of institutions are unable to sustain reliable long-term digital preservation activities.

Table 5. *Perceived Challenges in Preserving LLM Outputs (N = 71)*

Challenge Statement	SA	A	D	SD	M	SD_
LLM outputs are difficult to preserve due to their dynamic nature	18	29	13	11	**2.76**	1.01
Lack of technical expertise hinders preservation of LLM-generated content	26	31	6	8	**3.06**	0.95
Inadequate funding affects long-term digital preservation efforts	25	32	5	8	**3.01**	0.94
Absence of national or institutional AI preservation policies is a major challenge	24	33	6	7	**3.01**	0.91
Unstable power supply and poor internet connectivity affect digital preservation	37	18	9	5	**3.17**	0.94
Copyright and ownership issues complicate preservation of LLM outputs	27	26	10	8	**3.01**	0.99
Rapid technological obsolescence threatens long-term access to AI outputs	21	25	15	10	**2.80**	1.02
Grand Mean					**2.98**	**0.98**

Note. SA = Strongly Agree; A = Agree; D = Disagree; SD = Strongly Disagree; M = Mean; SD_ = Standard Deviation. Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree. Decision benchmark: M > 2.50 = agreement.

Table 5 addresses Research Question 3. Using a four-point Likert scale (1 = Strongly Disagree to 4 = Strongly Agree), respondents rated seven challenge statements. The grand mean of 2.98 (SD = 0.98) exceeds the benchmark midpoint of 2.50, indicating general agreement that all listed items represent significant barriers to the preservation of LLM outputs.

The highest-rated challenge was unstable power supply and poor internet connectivity (M = 3.17, SD = 0.94), with 37 respondents (52.1%) strongly agreeing with this item—the largest proportion of strong agreement across all challenge categories. This finding underscores that basic infrastructural deficits constitute the most immediate constraint on digital preservation capacity in South West Nigeria. Lack of

technical expertise (M = 3.06, SD = 0.95) ranked second, consistent with findings by Areo et al. (2023) that Nigerian archival professionals require structured capacity-building in digital preservation competencies. Inadequate funding (M = 3.01, SD = 0.94), the absence of AI-specific preservation policies (M = 3.01, SD = 0.91), and copyright and ownership issues (M = 3.01, SD = 0.99) were rated equally, underscoring the multifaceted nature of the policy and governance gap. Rapid technological obsolescence (M = 2.80, SD = 1.02) and the dynamic nature of LLM outputs per se (M = 2.76, SD = 1.01) were acknowledged as challenges but ranked below infrastructural and policy-related barriers, suggesting that professionals view environmental and systemic constraints as more pressing than the intrinsic technical characteristics of LLMs.

Table 6. *Professional Capacity and Training on AI Technologies (N = 71)*

Variable	Category	Frequency	Percent (%)
Received Formal Training on AI/AI Preservation	Yes	31	43.7
	No	40	56.3
AI Training is Necessary for Archival Professionals	Yes	65	91.5
	No	4	5.6
	Unspecified	2	2.8
Institutional Support for AI Training	Low	23	32.4
	Moderate-Low	17	23.9
	Moderate	18	25.4
	High	12	16.9
	Unspecified	1	1.4

Table 6 reveals a pronounced training deficit. More than half of respondents (56.3%) had not received any formal training in AI or AI-related preservation, despite a near-universal recognition (91.5%) that such training is necessary for archival professionals. Institutional support for AI training was rated as low by 32.4% and as moderate-low by a further 23.9%, meaning that 56.3% of respondents perceived institutional commitment to training as inadequate. Only 16.9% rated institutional support as high. This alignment of low training receipt with low institutional support points to a systemic gap between expressed professional need and institutional investment in capacity development—a gap that is particularly consequential given the rapid adoption of LLM tools for operational tasks.

Table 7. *Strategies and Policy Perspectives on Preserving LLM Outputs (N = 71)*

Variable	Category	Frequency	Percent (%)
Strategies to Improve Preservation of LLM Outputs	Development of AI preservation policies	6	8.5
	Staff capacity building	14	19.7
	Collaboration with ICT experts	9	12.7
	Increased funding	16	22.5
	Adoption of international preservation standards	26	36.6
Include AI-Generated Records in National Archival Frameworks	Yes	52	73.2
	No	4	5.6
	Not sure	15	21.1
Should Nigerian Archival Institutions Actively Preserve LLM Outputs?	Yes	32	45.1
	No	12	16.9
	Depends on the value	27	38.0

Table 7 addresses Research Question 4 on strategic priorities. The most widely endorsed strategy was adoption of international preservation standards (36.6%), followed by increased funding (22.5%) and staff capacity building (19.7%). Collaboration with ICT experts (12.7%) and development of AI-specific preservation policies (8.5%) received lower endorsement, though both represent critical governance mechanisms. The strong preference for international standards alignment is consistent with the broader evidence from sub-Saharan African archival studies that institutions facing preservation deficits tend to identify standards adoption as a priority corrective measure (Masenya & Ngulube, 2019).

A substantial majority of respondents (73.2%) supported the integration of AI-generated records into national archival frameworks, compared with only 5.6% who opposed this. When asked whether Nigerian archival institutions should actively preserve LLM outputs, however, responses were more nuanced: 45.1% endorsed active preservation, 38.0% adopted a value-contingent position, and 16.9% were opposed. This divergence between policy inclusion (strong support) and active preservation mandate (more conditional) reflects a mature professional recognition that not all LLM outputs possess equivalent archival value, and that selective, appraisal-based approaches are preferable to blanket preservation obligations.

IV. DISCUSSION

This study examined the long-term preservation challenges of LLM outputs in archival institutions in South West Nigeria, generating empirical evidence across five analytical domains: demographic context, LLM awareness and institutional use, perceptions of LLM output characteristics, digital preservation infrastructure and policy, and professional capacity and strategic priorities. The findings collectively reveal an archival sector that is actively engaging with AI technologies but remains structurally unprepared for the long-term preservation obligations these technologies generate.

The near-universal awareness of LLM technologies (93%) is consistent with global trends indicating rapid diffusion of AI tools into professional and institutional contexts. However, the gap between awareness and consistent institutional implementation—with 33.8% of institutions never using LLMs—reflects a well-documented pattern in technology adoption in which exposure precedes structured integration—a pattern well documented in technology adoption literature. The concentration of LLM use in service-oriented functions such as user services (32.4%) and content summarisation (23.9%) rather than core archival functions such as records appraisal or digital preservation workflow management suggests that LLMs are currently deployed for efficiency gains rather than as integral components of preservation systems. This operational-first adoption pattern may delay the development of governance frameworks adequate to manage the records status and preservation implications of AI-generated outputs.

The finding that 59.2% of respondents take a conditional position on whether LLM outputs constitute official records—defining their status as dependent on usage context—is theoretically significant. It suggests that practitioners are intuitively applying functional records theory: rather than defining records by their mode of creation, they define them by their capacity to document transactions, provide evidence, or fulfil accountability obligations. This aligns with established archival doctrine (CCSDS, 2012; Lavoie, 2014) but represents an emergent consensus that has yet to be formalised in Nigerian archival legislation or national policy frameworks. The parallel finding that 35.2% of respondents believe no LLM outputs are worth preserving reflects legitimate concerns about the evidential and administrative value of AI-generated materials, particularly given their non-deterministic character, as documented by Carlini et al. (2021) and Paullada et al. (2021). The professional community is, in effect, working out in real time the archival implications of technologies that neither its training nor its institutional frameworks were designed to address.

The identification of unstable power supply and poor internet connectivity as the most critical preservation challenge (M = 3.17) is consistent with broader scholarship on digital preservation constraints in sub-Saharan Africa. The scalable, hybrid preservation architectures recommended by Ubogu et al. (2023) remain aspirational in contexts where basic infrastructure is unstable, and the data stewardship lifecycle model of Albani and Maggio (2020)—premised on reliable digital infrastructure from the point of data creation—is similarly difficult to operationalise where power supply is intermittent. The significant endorsement of lack of technical expertise (M = 3.06) as a major barrier is equally consistent with Areo et al.'s (2023) finding that digital preservation competencies are underdeveloped among Nigerian information professionals. These two challenges—infrastructure and expertise—are mutually reinforcing: without reliable infrastructure, training on digital preservation tools and workflows cannot be effectively applied, and without trained personnel, infrastructural investments may be poorly utilised.

Notably, the inherent dynamic nature of LLMs (M = 2.76) and rapid technological obsolescence (M = 2.80) were rated lower than infrastructural and policy challenges. This finding refines the theoretical premise of the study: the preservation problem in South West Nigerian archives is not primarily a problem of LLM technology per se, but of the institutional and environmental conditions required to implement any sustainable digital preservation programme. This has important policy implications, as it suggests that investments in power infrastructure, internet connectivity, staff training, and preservation policy frameworks would yield greater preservation dividends than AI-specific technological solutions alone.

The disparity between general digital preservation policy coverage (91.6% of institutions having or developing one) and AI-specific preservation guidelines coverage (39.4% aware of any) represents a critical governance lacuna. This finding echoes Albani and Maggio's (2020) argument that lifecycle management policies must be updated to account for new categories of digital object, and the UNESCO (2021) principle that AI governance frameworks must be adapted to specific institutional contexts and operational realities. Without AI-specific preservation policies that address the unique characteristics of LLM outputs—including their non-deterministic nature, dependency on model versions and inference configurations, copyright status, and potential privacy implications—institutions cannot claim to be

managing AI-generated records responsibly, regardless of whether general digital preservation frameworks are in place.

The strong professional support for integrating AI-generated records into national archival frameworks (73.2%) provides a compelling mandate for policymakers and the National Archives of Nigeria to develop such frameworks. The preference for international standards adoption (36.6%) as the primary strategic priority suggests that institutions see alignment with OAIS-derived standards and other established preservation frameworks as the most effective path to sustainability—a view consistent with the foundational literature (CCSDS, 2012; Lavoie, 2014).

The finding that 56.3% of archival professionals have not received formal training in AI preservation, despite 91.5% recognising its necessity, points to a structural failure of professional development systems in the Nigerian archival sector. Institutional support for AI training was rated as low or moderate-low by 56.3% of respondents, indicating that this is not simply a matter of individual professional motivation but of systemic organisational under-investment. Raji et al. (2020) argue that effective AI accountability requires trained professionals who can audit, document, and evaluate AI system behaviour over time—a capacity that cannot be developed through informal exposure to AI tools alone. The training gap identified in this study therefore has implications not only for preservation practice but for the broader governance and accountability of AI use in Nigerian archival institutions.

V. CONCLUSION

This study has provided the first empirical examination of long-term preservation challenges for LLM outputs in archival institutions in South West Nigeria. The findings demonstrate a profession characterised by high awareness of AI technologies, emerging professional consensus on the conditional record status of AI-generated content, and acute structural deficits in the infrastructure, policy frameworks, and trained capacity required for sustainable preservation. Crucially, the study establishes that preservation challenges are driven primarily by infrastructural and systemic factors—power instability, funding constraints, policy gaps, and training deficits—rather than by the intrinsic technological characteristics of LLMs themselves. This finding reframes the policy problem: the priority is not exclusively to develop AI-specific technical preservation solutions but to build the institutional foundations on which any preservation programme depends.

The study makes several contributions. Theoretically, it extends the digital preservation literature by characterising LLM outputs as a categorically distinct archival challenge in the sub-Saharan African context, demonstrating that existing frameworks require adaptation to address the non-deterministic, context-dependent character of AI-generated artefacts. Practically, it generates context-specific evidence for archival policy development in Nigeria, where national frameworks for AI-generated records remain absent. The strong professional mandate identified for integrating AI-generated records into national archival frameworks and for adopting international preservation standards provides a clear direction for the National Archives of Nigeria and state-level archives.

Based on the findings, the study recommends that Nigerian archival institutions prioritise the development of AI-specific preservation policies and appraisal guidelines that define the conditions under which LLM outputs qualify as official records; invest in digital infrastructure, including stable power supply and reliable connectivity, as a prerequisite for effective preservation programmes; establish structured, nationally coordinated training programmes to build AI preservation competencies among archival professionals; align preservation frameworks with international standards such as OAIS (ISO 14721) as adapted for AI-generated content; and adopt value-based appraisal frameworks that enable selective preservation of LLM outputs according to evidential, administrative, and historical criteria rather than blanket retention or wholesale disposal.

Future research should explore the legal dimensions of AI-generated records in the Nigerian legislative framework, investigate the technical feasibility of metadata-based preservation strategies for LLM outputs in resource-constrained environments, and conduct longitudinal studies tracking changes in institutional practice as national AI governance frameworks develop. Comparative studies across other geopolitical zones of Nigeria and across West African archival institutions would further contextualise and enrich the evidence base.

REFERENCES

[1] Albani, M., & Maggio, I. (2020). Long-term data preservation: Data lifecycle, standardisation process, implementation and lessons learned. International Journal of Digital Curation, 15(1), Article 715. https://doi.org/10.2218/ijdc.v15i1.715

[2] Areo, P. O., Aliyu, A., & Jega, A. M. (2023). Perspectives in preservation of digital materials

in libraries: Skills and competencies. International Journal of Research and Innovation in Social Science, 7(69), 1096–1101. https://doi.org/10.47772/IJRISS.2023.7693

[3] Brichkovsky, V. (2023). Challenges and prospects of long-term preservation of digital cultural heritage. Bulletin of Armenian Libraries, 6(1), 19–22. https://doi.org/10.52027/journal.nla.am

[4] Carlini, N., Tramèr, F., Wallace, E., Jagielski, M., Herbert-Voss, A., Lee, K., Roberts, A., Brown, T., Song, D., Erlingsson, Ú., Oprea, A., & Raffel, C. (2021). Extracting training data from large language models. In Proceedings of the 30th USENIX Security Symposium (pp. 2633–2650). USENIX Association. https://www.usenix.org/conference/usenixsecurity21/presentation/carlini-extracting

[5] Consultative Committee for Space Data Systems (CCSDS). (2012). Reference model for an open archival information system (OAIS): Recommended practice (CCSDS 650.0-M-2). CCSDS Secretariat. https://public.ccsds.org/Pubs/650x0m2.pdf

[6] Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). SAGE Publications.

[7] Di Cosmo, R., & Zacchiroli, S. (2017). Software heritage: Why and how to preserve software source code. In iPRES 2017: Proceedings of the 14th International Conference on Digital Preservation (pp. 1–10). https://hal.science/hal-01590958

[8] Gebru, T., Morgenstern, J., Vecchione, B., Vaughan, J. W., Wallach, H., Daumé III, H., & Crawford, K. (2021). Datasheets for datasets. Communications of the ACM, 64(12), 86–92. https://doi.org/10.1145/3458723

[9] Khalid, A. (2022). Conservation challenges and emerging trends of digital preservation for UNESCO architectural heritage, Pakistan. Conservation, 2(1), 26–37. https://doi.org/10.3390/conservation2010003

[10] Kitchin, R. (2014). The data revolution: Big data, open data, data infrastructures and their consequences. SAGE Publications.

[11] Lavoie, B. F. (2014). The open archival information system (OAIS) reference model: Introductory guide (2nd ed., DPC Technology Watch Report 14-02). Digital Preservation Coalition. https://doi.org/10.7207/twr14-02

[12] Masenya, T. M., & Ngulube, P. (2019). Digital preservation practices in academic libraries in South Africa in the wake of the digital revolution. South African Journal of Information Management, 21(1), a1011. https://doi.org/10.4102/sajim.v21i1.1011

[13] Mitchell, M., Wu, S., Zaldivar, A., Barnes, P., Vasserman, L., Hutchinson, B., Spitzer, E., Raji, I. D., & Gebru, T. (2019). Model cards for model reporting. In Proceedings of the Conference on Fairness, Accountability, and Transparency (pp. 220–229). ACM. https://doi.org/10.1145/3287560.3287596

[14] Paullada, A., Raji, I. D., Bender, E. M., Denton, E., & Hanna, A. (2021). Data and its (dis)contents: A survey of dataset development and use in machine learning research. Patterns, 2(11), 100336. https://doi.org/10.1016/j.patter.2021.100336

[15] Pineau, J., Vincent-Lamarre, P., Sinha, K., Larivière, V., Beygelzimer, A., d'Alché-Buc, F., Fox, E., & Larochelle, H. (2021). Improving reproducibility in machine learning research (A report from the NeurIPS 2019 reproducibility program). Journal of Machine Learning Research, 22(164), 1–20. http://jmlr.org/papers/v22/20-303.html

[16] Raji, I. D., Smart, A., White, R. N., Mitchell, M., Gebru, T., Hutchinson, B., Smith-Loud, J., Theron, D., & Barnes, P. (2020). Closing the AI accountability gap: Defining an end-to-end framework for internal algorithmic auditing. In Proceedings of the 2020 Conference on Fairness, Accountability, and Transparency (pp. 33–44). ACM. https://doi.org/10.1145/3351095.3372873

[17] Ubogu, J. O., Ejimonye, O. C., Hubert-Nwangwu, O., Ekeh, U. C., & Ijantiku, C. M. (2023). Digital preservation challenges in the era of big data: Strategies for long-term information storage in libraries. International Journal of Academic Library & Information Science, 11(7), 249–253. https://doi.org/10.14662/ijalis2023270

[18] United Nations Educational, Scientific and Cultural Organization (UNESCO). (2021). Recommendation on the ethics of artificial intelligence. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000381137