



ARTIFICIAL INTELLIGENCE (AI) AND DIGITAL PRESERVATION STRATEGIES IN UNIVERSITY LIBRARIES IN RIVERS STATE, NIGERIA

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Abstract

The study examines artificial intelligence and digital preservation strategies in university libraries in Rivers State, Nigeria. Four objectives and four research questions were formulated to guide the study. The population of the study comprises 120 staff from three university libraries in Rivers State, Nigeria. University of Port Harcourt 32 (18 professionals and 14 paraprofessionals), Rivers State University 53 (10 Professionals and 43 paraprofessionals), Ignatius Ajuru University of Education 35, (11 professionals and 24 paraprofessionals). Only 105 copies of the questionnaire were found valid for analysis. A descriptive survey was adopted for the study. The census sampling technique was employed in the study, where the entire population served as the sample size. The instrument for data collection was a self-structured Questionnaire titled "Artificial Intelligence and Digital Preservation Strategies Questionnaire (AIDPS)". Mean and standard deviation were used to answer the research questions. The findings revealed that automated metadata generation, digital object identification, predictive maintenance, and risk management, among others, were some of the ways AI technologies can enhance the preservation of digital resources. Governance and policy, as well as sustainable infrastructure, were identified as some of the strategies that can be developed to guide the sustainability of AI and digital preservation. Again, the study reveals that AI saves time, detects and repairs corrupted or degraded files, and improves accessibility for researchers and students, among others. Bias and inaccuracy in metadata and classification, resources, and cost barriers, and digital obsolescence of AI models were discovered as some of the challenges affecting the application of AI in the preservation of digital resources, among others. Based on the findings, the study recommended that: universities should integrate AI technologies into their digital repositories to automate metadata generation, the various strategies identified should be implemented or considered to guide the ethical use, implementation, and maintenance of AI tools in digital preservation, among others.

Keywords: Artificial Intelligence, digital preservation, university libraries



Introduction

Over the years, university libraries have played the role of housing and preserving information resources. However, the recent advancement in technology, specifically within digitization, has significantly eased the challenging task of preserving cultural heritage. As Goudaroli et al. (2019) state, “the arrival of new information and communication technologies radically alters the way in which people create, access, and engage with information and archival records”. Artificial Intelligence (AI) as the future architect has now emerged as a pivotal force in safeguarding our unique cultural legacy for generations to come (Ibaraki, 2019).

Artificial Intelligence (AI) is a field of computer science focused on developing systems that can perform tasks typically requiring intelligence, including reasoning, learning, perception, and decision-making (Russell & Norvig, 2021). In recent years, the integration of AI technologies has reshaped many domains, including the management and preservation of digital information. Digital preservation, which refers to the processes and strategies used to maintain and ensure the long-term accessibility of digital materials, faces growing challenges due to technological obsolescence, data degradation, and the rapid evolution of digital formats (Couway, 2020).

Artificial Intelligence contributes to digital preservation through automation, pattern recognition, and predictive analytics. Machine learning and natural language processing, for instance, can enhance metadata generation, automated content classification, detect anomalies, and restore degraded files with high precision (Makhoul et al, 2022). AI systems can assess preservation risk and propose proactive management strategies, improving efficiency and reliability of digital repositories (Cox et al, 2021). The convergence of AI and digital preservation represents a transformative development in cultural heritage and information science. By integrating AI-driven tools into preservation workflows, institutions such as libraries, archives, and museums can ensure



the longevity, integrity, and accessibility of digital assets, thereby safeguarding collective memory for future generations (Digital Preservation Coalition, 2023).

Furthermore, university libraries house an extensive array of invaluable records, ranging from rare manuscripts and historical documents to a vast collection of digital media (Jan, Khan, and Khan, 2024). The protection and preservation of these records are paramount, ensuring their availability for future generations (Manoharan, et al., 2024). Artificial intelligence (AI) has emerged as a powerful tool in safeguarding library records against both physical and digital threats. AI systems are equipped with sensors and IoT (Internet of Things) devices that play a crucial role in monitoring environmental conditions within the libraries (Xie et al., 2022).

Again, the integration of AI has the potential to elevate the role of librarians from mere custodians of information to knowledge navigators, curators, and facilitators of meaningful interactions between users and resources (David-West & IG-Worlu, 2023). This will make room for simplicity, and without seeking direct human intelligence, to always be responsible in carrying out library services.

Statement of the Problem

University library generates and stores vast amounts of digital data, including research outputs, books, journals, administrative records, and learning materials. Preserving these digital assets for long-term access has become increasingly challenging due to rapid technological changes and growing data complexity. While Artificial Intelligence (AI) offers opportunities to enhance digital preservation through automation and intelligent data management, concerns about reliability, transparency, and ethical use persist. The problem, therefore, is how universities can effectively and responsibly apply AI to ensure the authenticity, accessibility, and sustainability of their digital resources over time.



Purpose of the Study

The main purpose of the study is to examine how Artificial Intelligence (AI) can be utilized to enhance the digital preservation practices of university libraries in Rivers State, Nigeria. Specific purposes:

1. Examine how Artificial Intelligence (AI) technologies improve the digital preservation process in university libraries in Rivers State.
2. Propose strategies for the adoption of AI in university libraries.
3. Assess the benefits of integrating AI tools into preservation system
4. Ascertain the challenges of integrating AI tools into preservation system

Research Questions

1. In what ways can AI technologies enhance digital preservation practices in university libraries in Rivers State?
2. What strategies can be developed to guide the sustainable integration of AI into digital preservation systems in university libraries in Rivers State?
3. What are the potential benefits of applying AI in the preservation of digital resources in university libraries in Rivers State?
4. What are the challenges of applying AI in the preservation of digital resources in university libraries in Rivers State?

Literature Review

According to Netshakhuma (2019), AI technologies are making significant strides in the preservation and restoration of digital and physical records. For digital preservation, AI monitors the health of digital files, detects signs of corruption, and performs automated repairs (Manoharan, Ashtikar, and Nevedha 2024). In the context of physical records, computer vision and machine



learning algorithms analyses and restore digitized images of damaged documents, ensuring that valuable historical and cultural records are preserved for future generations (Modiba, 2022). As Barsha and Munshi (2024) observed, the search and retrieval of records in a large library database can be greatly improved through AI. Ajani et al (2022) state that AI-powered search engines leverage NLP and semantic search capabilities to better understand users' queries and deliver more relevant results. These systems can analyze the context and intent behind search queries, making it easier for users to find the exact records they need.

Furthermore, AI personalized search results based on user behavior and preferences, enhancing the overall user experience (Kusumawati and Salim 2022). Safeguarding library records from both physical and digital threats is a critical concern (Modiba, Xie, Siyi, and Han 2022). Trehan (2023) states that AI plays a crucial role in enhancing security measures through predictive analytics and anomaly detection. AI systems continuously monitor access logs and user activities to detect unusual patterns that may indicate potential security breaches or fraudulent activities (Omigie, Krubu, and Anthony 2023). Empirical studies demonstrate variation in AI adoption across global contexts. For examples, Nigerian university libraries face infrastructure shortage and limited expertise that constrain full engagement with AI preservation tools (Idhalama & Nwachukwu, 2025). Incorporating AI into library workflows raises ethical, governance, and professional concerns (Das, 2024). Ethical consideration include bias in AI systems, transparency in metadata generation, and accountability when automation affects archival decision-making. Best practice frameworks emphasize human-in-the-loop governance, where AI supports but does not replace professional judgment and oversight (Holzinger et al., 2024).

Methodology

The study adopted a descriptive survey research design. The population of the study comprises 120 staff from university libraries in Rivers State, Nigeria. University of Port Harcourt 32 (18



professionals and 14 paraprofessionals), Rivers State University 53 (10 Professionals and 43 paraprofessionals), Ignatius Ajuru University of Education 35, (11 professionals and 24 paraprofessionals). A census sampling technique was used for the study to select the entire population. The instrument for data collection was a self-structured questionnaire titled “Artificial Intelligence and Digital Preservation Strategies (AIDPS)”. The instrument was designed on a four-point Likert rating scale of Strongly Agree (SA) =4, Agree (A)=3, Disagree (D)=2, Strongly Disagree (SD) =1. The instrument was administered to the respondents and collected from time to time within week. Only 105 copies of the questionnaire were found valid for analysis. The data collected were analyzed using mean and standard deviation.

Results and Discussion

Table 1: In what ways can AI technologies enhance digital preservation activities in universities in Rivers State?

S/N	Items	Mean	Std	Remark
1	Automated metadata generation	3.2	15.2	Accepted
2.	Digital object identification	3.0	21.2	Accepted
3	Predictive maintenance and Risk management	3.3	24.7	Accepted
4	Intelligent data curation and organization	3.2	22.8	Accepted
5	Does not enhance access and engagement	1.5	76.2	Accepted
Average mean		2.84		

Table 1 reveals that items (1,2,3,4) were accepted because their criteria mean was above 2.5, the cut-off point for decision, while item (5) was rejected because the mean score was below 2.5 of the criteria mean. The table also reveals that item (3) has the highest mean score of (3.3) while item (5) has the lowest mean score of (1.5). Again, an average mean of (2.84) was obtained, which indicates that AI technologies can enhance digital preservation activities in universities in Rivers State.

Table 2: What strategies can be developed to guide the sustainable integration of AI into the digital preservation system in universities in Rivers State?



S/N	Items	Mean	Std	Remark
1	Governance and policy	3.6	27.5	Accepted
2.	Sustainable infrastructure	3.3	22.5	Accepted
3	Non-human-centered and collaborative integration	1.6	9.6	Rejected
4	Transparency, explainability, and trust	3.5	25.8	Accepted
5	Continuous evaluations and adaptation	3.6	28.0	Accepted
Average mean		3.12		

Table 2 reveals that items (1,2,4,5) were accepted because their criteria mean was above 2.5, the cut-off point for decision, while item (3) was rejected because the mean score was below 2.5 of the criteria mean. The table also reveals that item (1,5) has the highest mean score of (3.6) while item (3) has the lowest mean score of (1.6). Again, an average mean of (3.12) was obtained, which indicates that there are strategies that can be developed to guide the sustainable integration of AI into digital preservation systems in universities in Rivers State.

Table 3: What are the potential benefits of applying AI in the Preservation of digital resources in universities in Rivers State?

S/N	Items	Mean	Std	Remark
1	Saves time	3.6	29.6	Accepted
2.	Detect and repair corrupted or degraded files	3.4	24.8	Accepted
3	Does not enhance digital preservation	1.6	9.0	Rejected
4	Improve accessibility for researchers & students	3.3	23.5	Accepted
5	Enables proactive preservation	3.5	26.6	Accepted
Average mean		3.06		

Table 3 reveals that items (1,2,4,5) were accepted because their criteria mean was above 2.5, the cut-off point for decision, while item (3) was rejected because the mean score was below 2.5 of the criteria mean. The table also reveals that item (1) has the highest mean score of (3.6) while item (3) has the lowest mean score of (1.6). Again, an average mean of (3.06) was obtained, which indicates that there are potential benefits in applying AI in the preservation of digital resources in universities in Rivers State.



Table 4: What are the challenges of applying AI in the Preservation of digital resources in universities in Rivers State?

S/N	Items	Mean	Std	Remark
1	Bias and inaccuracy in metadata and classification	3.4	24.8	Accepted
2.	Resources and cost barriers	3.5	26.7	Accepted
3	Digital obsolescence of the AI model	3.3	24.4	Accepted
4	Non-reliance on proprietary AI tools	1.8	11.6	Rejected
5	Data privacy and ethical concerns	3.2	24.2	Accepted
Average mean		3.04		

Table 3 reveals that items (1,2,3,5) were accepted because their criteria mean was above 2.5, the cut-off point for decision, while item (4) was rejected because the mean score was below 2.5 of the criteria mean. The table also reveals that item (2) has the highest mean score of (3.5) while item (4) has the lowest mean score of (1.8). Again, an average mean of (3.04) was obtained, which indicates challenges of applying AI in the preservation of digital resources in universities in Rivers State.

Discussion of Findings

The study reveals the various ways AI technology can enhance digital preservation activities in universities in Rivers State. It also reveals that automated metadata generation, digital objects identification, predictive maintenance, and risk management, among others, as some of the ways AI technologies can enhance preservation of digital resources. This findings is supported by Netshakhuma (2019), who state that AI technologies are making significant strides in the preservation and restoration of digital and physical records.

The study reveals the different types of strategies that can be developed to guide the sustainable integration of AI into digital preservation systems in universities in Rivers State. Governance and policy, sustainable infrastructure, among others, were identified as some of the strategies that can be developed to guide the sustainability of AI and digital preservation. The study aligns with hat



of Das (2024) who discovered that digital transformation, infrastructure, service delivery, and governance are sustainable preservation practices and smart sustainable cities.

The study also reveals some potential benefits of applying AI in the preservation of digital resources in universities in Rivers State. The study also reveals that AI saves time, detects and repairs corrupted or degraded files, and improves accessibility for researchers and students, among others. This study is in line with the study of Ajani et al (2022) which noted that AI-powered search engines leverage NLP and semantic search capabilities to better understand users' queries and deliver more relevant results which saves time and improves accessibility.

The study reveals some challenges affecting the application of AI in the preservation of digital resources in universities in Rivers State. The study also reveals Bias and inaccuracy in metadata and classification, resources, and cost barriers and digital obsolescence of AI models as some of the challenges affecting the application of AI in the preservation of digital resources, among others. This is consistent with the study of Idhalama and Nwachukwu (2025) who identified some of the challenges faced in the use of AI to include bias, technological infrastructure inaccuracy of data.

Conclusion

Artificial Intelligence has emerged as an informative force in digital preservation strategies within academic institutions, offering innovative solutions to long-standing challenges associated with the management, accessibility, and sustainability of digital resources. As university libraries increasingly confront issues of digital content proliferation, format obsolescence, and resource constraints, AI-driven tools provide enhanced capabilities for automating metadata creation, providing content discovery, supporting predictive preservation, and optimizing workflow efficiency. Again, AI enhances digital preservation in universities by enabling automation, which reduces manual workload. Prediction, which is anticipating risks, discovery, which is improving access, sustainability, which is optimizing resources, and trust, which is ensuring authenticity. A sustainable AI integration strategy for digital preservation in universities should balance technological innovation with ethical accountability, efficiency with transparency, and automation with human expertise.



Recommendations

Based on the findings of the study, it is recommended that:

1. Adopt AI-driven Preservation Systems. Universities should integrate AI technologies into their digital repositories to automate metadata generation, digital object identification, and intelligent data curation and organization.
2. The various strategies identified should be implemented or considered to guide the ethical use, implementation, and maintenance of AI tools in digital preservation.
3. Universities should invest in staff training and capacity building to equip librarians, archivists, and IT personnel with the necessary skills to manage and maintain AI-based preservation tools to achieve the desired or expected benefits.
4. Universities should allocate sufficient budgets for acquiring AI infrastructure software and a reliable digital storage system to ensure sustainability and efficiency in preservation practices.

References

- Ajani, Y.A., A. Tella, K.Y. Salawu, & F. Abdullahi (2022). Perspective of librarians on awareness and readiness of academic libraries to integrate artificial intelligence for library operations & services in Nigeria. *Internet Reference Services Quarterly*, 26(4), 213-230. <https://doi.org/10.080/1087530/2022.2086/96>
- Conway, P. (2020). Preservation in the age of digital reproduction. *Library trends*, 69(1), 1-21
- Cox, A.M., Pinfield, S., & Smith, J. (2021). Research data management and artificial intelligence: Opportunities and Challenges. *Journal of Documentation*, 77(4), 887-904.
- David-West, B.T. & IG-Worlu, M.O. (2023). AI-driven future strategies and skill development for Nigerian Librarians. *Gateway Information Journal*, 23(1), 9-12.
- Das, D. K. (2024). Exploring the symbiotic relationship between digital transformation, infrastructure, service delivery, and governance for smart sustainable cities. *Smart Cities*, 7(2), 806-835.



- Digital Preservation Coalition. (2023). Artificial Intelligence and Digital Preservation: Opportunities and Challenges. <https://www.dpconline.org>
- Goudarouli, E., A. Sexton, and J. Sheridan. (2019). The Challenge of the Digital and the Future Archive: Through the Lens of the National Archives UK.” *Philosophy & Technology* 32: 173–83
- Holzinger, A., Zatloukal, K., & Müller, H. (2024). Is human oversight to AI systems still possible?. *New biotechnology*.
- Ibaraki, S. (2019). Artificial Intelligence for Good: Preserving Our Cultural Heritage.” *Forbes*, March 28. <https://www.forbes.com/sites/cognitiveworld/2019/03/28/artificial-intelligence-for-goodpreserving-our-cultural-heritage/> (accessed February 8, 2024).
- Idhalama, O. U., & Nwachukwu, P. I. (2025). Assessing the application of artificial intelligence and machine learning technologies in library services in Africa. *Library Management*, 46(5), 386-400.
- Jan, S.U., M.S.A. Khan, & A.S. Khan. (2024). “Organizational Readiness to Adopt Artificial Intelligence in the library and information sector of Pakistan”. *Evidence-Based Library and Information Practice* 19(1) 58-76. <https://doi.org/10.8438/eblib30408>
- Kusumawati, L., & T. Salim (2022). Artificial Intelligence and Knowledge Management Implementation in Electronic Archives Preservation: Literature Review”. *International Journal of Innovation Science & Research Technology* 7(5):340-345
- Makhout, J., Zoghby, N., & Matar, A. (2022). The role of artificial Intelligence in cultural heritage preservation. *International Journal of Digital Curation*. 1(1), 45-62
- Modibia, M., P. Ngulube, & N. Marutha (2022). Infrastructure for the implementation of Artificial Intelligence to support Records Management at the Council for Scientific and



Industrial Research in South Africa”. ESARBICA Journal 41. 159-171.

<https://doi.org/10.4314/esarjo.u4/i.11>

Manoharam, G., S.P. Ashtikar, and M. Nivedha (2024). “Integrating Artificial Intelligence in Library Management: An Emerging Trend”. In AI-Assisted Library Reconstruction, edited by A.R. Senthikumar, 144-157. IGI Global. <http://doi.org/10.4018/979-8-3693-2782-I.ch008>

Netshakhuma, N.S. (2019). The future of archivists and records managers in Mpumalanga, South Africa” *Mousaion*, 37(4): 17 pages. <https://doi.org/10.25159/2663.654/6796>

Trehan, U. (2023). AI-Power Archives: Revolutionizing Information Access for the Future” in 2023 IEEE International Conference on Big Data (Big Data), 6298-6300. IEEE. <https://doi.org/10.1109/BigData59044.2023.10386963>

Xie, S.L., Siyi, L. & Han, R. (2022). Competing with Artificial Intelligence Can the Records and Information Management Profession Withstand the Challenge? *Records Management Journal*, 32(2): 151-169. <https://doi.org/10.1108/RMJ-08-2021-0033>