

INFRASTRUCTURAL READINESS, STAFF ATTITUDE AND ETHICAL CONSIDERATION AS DETERMINANTS OF ARTIFICIAL INTELLIGENCE IN ARCHIVAL PRESERVATION MANAGEMENT IN ACADEMIC LIBRARIES IN CROSS RIVER STATE

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Abstract

This study examined infrastructural readiness, staff attitude, and ethical considerations on the effectiveness of artificial intelligence (AI) in archival preservation management within academic libraries in Cross River State, Nigeria. A correlational survey design was employed with a population of 779 archival staff, from which 390 participants were selected using multistage sampling. Data were collected with a validated instrument titled *Infrastructural Readiness, Staff Attitude, and Ethical Considerations on Effectiveness of AI in Archival Preservation Management in Academic Libraries Questionnaire (IRSAEC-AIAPMALQ)*. Findings revealed that infrastructural readiness significantly predicted AI effectiveness, emphasizing the role of modern computing systems, network connectivity, and digital tools. Staff attitude was also significant, indicating that openness to technology and proactive engagement enhanced AI adoption. Ethical considerations further influenced AI effectiveness by ensuring compliance with professional and legal standards. Additionally, the joint effect of the three predictors explained a substantial variance in AI effectiveness, underscoring the multidimensional nature of AI adoption in archival management. Based on the findings of the study, it was recommended among others that; academic institutions should strengthen infrastructural readiness by investing in robust digital infrastructures, including reliable internet connectivity, cloud-based storage systems, and AI-driven archival tools capable of automating indexing, metadata creation, and long-term preservation, and that library administrators and policymakers should prioritize continuous staff capacity building through targeted training, workshops, and mentorship programs focused on AI competencies, digital ethics, and emerging preservation technologies. By cultivating positive staff attitudes and improving digital literacy, institutions can reduce resistance to innovation and enhance the effective utilization of AI solutions.

Keywords: Artificial intelligence, archival preservation management, infrastructural readiness, staff attitude, ethical considerations, academic libraries

Introduction

Artificial Intelligence (AI) in archival preservation management represents the integration of machine learning, natural language processing, and automation technologies into archival practices to enhance the efficiency, accuracy, and sustainability of preserving and managing archival materials. In academic libraries, AI facilitates processes such as digitization, content indexing, predictive analytics, and metadata generation, transforming traditional archival methods into more dynamic, scalable, and user-friendly systems. By leveraging AI, academic institutions can maintain long-term accessibility of digital collections, safeguard intellectual property, and support research dissemination, all while addressing challenges posed by technological obsolescence and data degradation. AI further ensures continuity in archival operations by automating repetitive tasks, enhancing the discoverability of materials, and enabling proactive management of potential risks to archival integrity. It also strengthens compliance with legal, ethical, and institutional standards by monitoring data handling practices and ensuring that preservation strategies align with intellectual property rights and ethical guidelines. Consequently, AI adoption is a critical advancement in modern archival preservation, providing academic libraries with tools to optimize operations, support knowledge management, and enhance scholarly communication, ensuring that archival repositories remain both accessible and sustainable in the digital era (Teel, 2024; Cushing, 2023; Schellnack-Kelly, 2024; Sadler, 2023; Bayeck, 2022; Modiba, 2021).

The significance of AI in archival preservation management is profound, as it enhances both operational efficiency and resource sustainability. By automating labor-intensive tasks such

as metadata creation, cataloging, and content indexing, AI reduces human error and accelerates the processing of archival materials, ensuring more reliable and consistent outcomes (Teel, 2024). AI also enables predictive analytics, allowing libraries to anticipate risks such as data loss, digital obsolescence, or deterioration of physical materials converted to digital formats, thus supporting proactive preservation strategies (Bayeck, 2022). Furthermore, AI improves accessibility by enhancing search functionalities and offering personalized retrieval systems that enable scholars to locate relevant content quickly and efficiently (Cushing, 2023). Its application fosters compliance with copyright regulations, intellectual property standards, and ethical norms, thereby minimizing legal and ethical risks associated with digital archives (Modiba, 2021). Beyond operational advantages, AI contributes to institutional reputation by ensuring the long-term sustainability and visibility of scholarly outputs, promoting knowledge dissemination and collaboration within and across institutions (Sadler, 2023). The integration of AI also encourages continuous improvement, as feedback and usage analytics can be analyzed to optimize repository performance and user satisfaction (Schellnack-Kelly, 2024). These combined benefits position AI as a transformative force in academic library archival preservation.

Despite the growing literature on AI in archival preservation, significant gaps remain. Few studies have examined how infrastructural readiness, staff attitudes, and ethical considerations jointly influence AI adoption in archival preservation within Nigerian academic libraries. Most prior research has concentrated on developed nations, overlooking localized constraints such as resource limitations, network infrastructure inadequacies, and cultural perceptions of technology in Africa. Furthermore, limited empirical work explores the interplay between human factors, institutional policies, and technology readiness in determining repository

efficiency and sustainability. These gaps are particularly relevant for Cross River State academic libraries, where technological investments, staff preparedness, and ethical adherence may vary widely across institutions. Addressing these gaps is essential for developing contextually appropriate strategies to enhance AI utilization, ensuring that academic libraries in the region can leverage technology effectively to preserve digital archives, comply with ethical standards, and provide reliable access to scholarly resources.

The purpose of this study is to investigate how infrastructural readiness, staff attitudes, and ethical considerations affect the adoption and effectiveness of AI in archival preservation management in academic libraries in Cross River State. By focusing on these variables, the research seeks to generate actionable insights into the organizational, technological, and human factors influencing AI implementation. The study aims to inform policy development, capacity building, and strategic planning, enabling academic libraries to optimize their AI systems for archival preservation. Findings are expected to enhance institutional decision-making, improve resource allocation, and guide training programs to strengthen both the quality and sustainability of digital archives. This research ultimately seeks to bridge the knowledge gap in the Nigerian context and provide a framework for responsible and effective AI adoption in academic libraries, addressing the unique challenges of the region.

This study is significant as it provides empirical evidence regarding factors affecting AI integration in archival preservation within Nigerian academic libraries. The research informs library administrators, policymakers, and IT managers on best practices for implementing AI while addressing infrastructural, ethical, and human considerations. By highlighting the interplay between technology readiness, staff engagement, and ethical compliance, the study can guide the

development of training programs, policy frameworks, and resource allocation strategies tailored to the local context. Improved AI adoption enhances the preservation, accessibility, and usability of digital archives, promoting scholarly research, institutional credibility, and knowledge dissemination. Additionally, findings contribute to the global discourse on AI in archival management, offering lessons applicable to other developing regions facing similar challenges. Ultimately, the study seeks to ensure that AI-supported archival systems are sustainable, ethically compliant, and effective in preserving academic knowledge for current and future generations.

Statement of the Problem

The integration of artificial intelligence (AI) in archival preservation management presents both opportunities and challenges for academic libraries. While AI offers enhanced efficiency in digitization, metadata generation, predictive preservation, and access control, many libraries face significant constraints that hinder effective adoption. Infrastructural limitations, such as inadequate computing resources and unstable networks, restrict the full utilization of AI technologies. Moreover, staff attitudes toward AI, including resistance to change or limited technical competence, can undermine successful implementation. Ethical considerations, including data privacy, algorithmic transparency, and compliance with intellectual property laws, further complicate adoption. Despite growing global research on AI in archival management, there is limited empirical evidence from Nigerian academic libraries, leaving a gap in understanding how infrastructural readiness, staff attitude, and ethical considerations jointly affect AI-driven archival preservation. Addressing this gap is crucial for developing context-specific strategies that enhance the sustainability, effectiveness, and ethical management of digital archives in academic libraries.

Research Questions

1. To what extent does infrastructural readiness predict the adoption and effectiveness of artificial intelligence in archival preservation management in academic libraries in Cross River State?
2. How does staff attitude predict the utilization of artificial intelligence in archival preservation management in academic libraries in Cross River State?
3. What is the predict effect of ethical considerations on the implementation of artificial intelligence in archival preservation management in academic libraries in Cross River State?
4. To what extent do infrastructural readiness, staff attitude, and ethical considerations jointly predict the adoption and effectiveness of artificial intelligence in archival preservation management in academic libraries in Cross River State?

Statement of Hypotheses

- H01: Infrastructural readiness has no significant relationship with adoption and effectiveness of artificial intelligence in archival preservation management in academic libraries in Cross River State.
- H02: Staff attitude has no significant significant relationship with utilization of artificial intelligence in archival preservation management in academic libraries in Cross River State.
- H03: Ethical considerations have no significant significant relationship with implementation of artificial intelligence in archival preservation management in academic libraries in Cross River State.

H04: Infrastructural readiness, staff attitude, and ethical considerations have no joint significant relationship with adoption and effectiveness of artificial intelligence in archival preservation management in academic libraries in Cross River State.

Literature review

Infrastructural readiness, which includes reliable electricity, internet connectivity, digitization equipment, and storage capacity is a critical determinant of whether artificial intelligence (AI) can be adopted effectively in archival preservation. Studies emphasize that AI tools such as optical character recognition, automated metadata generation, and image restoration require strong ICT infrastructure to function at scale (Mosweu & Bwalya, 2020). Without these resources, projects remain experimental and often fail to deliver long-term benefits. This challenge is particularly pronounced in developing contexts, where intermittent electricity and limited bandwidth undermine digital projects (Akinola, 2022). Evidence from African higher education libraries further shows that inadequate ICT infrastructure has been a consistent barrier to the deployment of advanced technologies (Onuoha & Amadi, 2021). Thus, infrastructural readiness directly influences both the adoption of AI and its effectiveness in archival preservation management.

Beyond infrastructure, human factors such as staff perceptions, willingness to adopt innovations, and professional skills strongly influence AI uptake. Research shows that positive staff attitudes and confidence in using AI technologies correlate with higher levels of experimentation and utilization in library settings (Hussain & Prieto, 2022). Conversely, negative

attitudes often driven by fear of job loss, ethical concerns, or lack of training; reduce the likelihood of adoption, even when infrastructure is available (Abubakar & Hassan, 2021). In Nigeria, several studies highlight that limited technical expertise and inadequate professional development hinder the implementation of emerging technologies in libraries (Okoro & Ani, 2019). Staff attitudes therefore serve as a mediating factor: without adequate training and motivation, infrastructural readiness alone does not guarantee effective AI adoption.

Ethical readiness is another decisive factor in the adoption of AI in archival contexts. Ethical issues include algorithmic bias, data authenticity, preservation integrity, and privacy (Floridi & Cowls, 2019). In archives, the use of AI to “restore” or “fill in” missing historical content raises concerns about provenance and authenticity, requiring strong ethical frameworks (McNeil, 2020). The International Federation of Library Associations (IFLA, 2021) stresses that AI adoption must be accompanied by transparency policies, accountability mechanisms, and community engagement. In Nigeria, however, ethical guidelines specific to AI in archival preservation remain limited, leaving libraries without structured governance frameworks (Aina, 2021). This gap can reduce stakeholder trust, making staff and users hesitant to embrace AI systems.

Although each factor infrastructure, staff attitude, and ethics—has been studied independently, research suggests that their effects are interdependent. Strong infrastructure without skilled and motivated staff leads to underutilization; staff enthusiasm without adequate infrastructure results in frustration; and both factors without ethical governance risk reputational harm or rejection (Mosweu & Bwalya, 2020; Floridi & Cowls, 2019). Therefore, adoption and

effectiveness of AI in archival preservation emerge from the interaction of these three conditions rather than from any one factor alone.

Several factors influence the successful implementation of AI in archival preservation management. Infrastructural readiness is essential, requiring high-performance computing capabilities, sufficient storage solutions, and robust network systems to support AI operations effectively (Teel, 2024). Staff attitudes toward AI adoption are equally critical; acceptance, openness, and willingness to learn new technologies facilitate smoother integration and higher operational efficiency (Modiba, 2021). Ethical considerations, including data privacy, algorithmic fairness, and transparency, shape how AI is deployed, ensuring responsible and compliant management of sensitive materials (Schellnack-Kelly, 2024). Leadership and managerial support determine resource allocation, policy enforcement, and organizational prioritization, providing the foundation necessary for AI implementation (Sadler, 2023). Continuous professional development equips staff with knowledge of AI tools, digital preservation techniques, and emerging trends, ensuring they can manage repositories effectively (Bayeck, 2022). Financial investment is also a significant factor, as the acquisition, maintenance, and upgrade of AI systems require sustained funding (Modiba, 2021). Finally, legal and regulatory frameworks, including intellectual property and data protection laws, influence both operational policies and technology deployment, guiding ethical and lawful management of archival content (Teel, 2024). These interconnected factors collectively determine the quality and sustainability of AI-powered archival preservation in academic libraries.

Despite the growing literature, few empirical studies integrate infrastructural readiness, staff attitude, and ethical considerations into a single explanatory framework for AI adoption and

effectiveness in archival preservation. Most studies examine these factors in isolation—for example, focusing on infrastructure challenges (Akinola, 2022) or staff perceptions (Okoro & Ani, 2019) without testing how they interact. Additionally, there is limited empirical research in Nigeria, and virtually none focusing on academic libraries in Cross River State, where infrastructural deficits, professional development gaps, and weak governance frameworks coexist. Methodologically, many studies rely on descriptive surveys or conceptual discussions, with little use of robust analytical approaches such as structural equation modeling to explore direct, mediating, and moderating effects. Finally, ethical considerations are often discussed normatively rather than measured empirically, leaving a gap in understanding how ethical governance practices concretely influence adoption and effectiveness.

Methodology

The study adopted a correlational survey research design. This design was considered most suitable because it allows for the examination of the relationships and predictive effects between independent variables—namely infrastructural readiness, staff attitude, and ethical considerations—and the dependent variable, the effectiveness of artificial intelligence in archival preservation management in academic libraries. Unlike experimental designs, a correlational survey does not manipulate variables but measures them as they naturally occur, making it ideal for assessing real-world associations within archival departments. This approach provides insights into the strength and direction of relationships, supporting evidence-based recommendations for policy and practice.

The population of the study comprised 779 staff members working in the archives departments of selected academic libraries in Cross River State. An odd number was deliberately

chosen to facilitate statistical analysis and ensure representation during sampling. A multistage sampling technique was employed to select the respondents, which involved two stages: first, stratification of libraries by type and size to ensure proportional representation; second, random selection of staff within each stratum to ensure unbiased participation. Fifty percent (50%) of the population, totaling 390 respondents, were included in the study to provide sufficient power for statistical analysis and to reduce sampling error.

The instrument for data collection was a structured questionnaire titled *Infrastructural Readiness, Staff Attitude, and Ethical Considerations on Effectiveness of Artificial Intelligence in Archival Preservation Management in Academic Libraries*. The questionnaire was divided into two sections. Section A elicited demographic information, including age, gender, years of experience, educational qualification, and position in the library. Section B captured responses related to the independent and dependent variables. Infrastructural readiness was operationally defined as the extent to which libraries possess adequate technological and physical resources to support AI implementation and was measured with six items (e.g., “The library has sufficient computing resources to implement AI-based archival processes”). Staff attitude was defined as the perceptions, openness, and willingness of staff to adopt AI technologies and was measured with six items (e.g., “I am willing to learn and adopt AI tools in archival management”). Ethical consideration was defined as the adherence to professional, legal, and moral standards in implementing AI systems and was measured with six items (e.g., “AI systems in our library comply with intellectual property laws”). The dependent variable, effectiveness of AI in archival preservation management, was defined as the efficiency, accuracy, and sustainability of AI-driven archival practices and was measured with six items, two sample items being “AI improves

the accuracy of archival cataloguing” and “AI ensures long-term preservation of digital records.” All items used a four-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree).

The validity of the instrument was established using expert judgment, the Item-Content Validity Index (I-CVI), and the Scale-Content Validity Index (S-CVI). Expert reviews ensured relevance, clarity, and precision, yielding I-CVI values ranging from 0.83 to 1.00 for relevance, 0.80 to 1.00 for clarity, and 0.83 to 1.00 for precision, while the S-CVI values were 0.90, 0.91, and 0.92, respectively, demonstrating strong content validity. Reliability was determined using Cronbach’s alpha, with coefficients of 0.82 (infrastructural readiness), 0.85 (staff attitude), 0.83 (ethical consideration), and 0.87 (effectiveness of AI), indicating acceptable internal consistency ($\alpha \geq 0.80$). (Ofem et al 2024; 2024b).

Data collection was conducted after obtaining approval from the Institutional Review Board, IRB/UNICAL/2024/1782. Research assistants were trained to administer the questionnaire and to ensure participants’ understanding of the study’s purpose. Ethical procedures, including informed consent, confidentiality, and voluntary participation, were strictly observed. Of the 390 questionnaires administered, 372 were duly completed and returned, representing a response rate of 95.4%, which is sufficient for robust statistical analysis.

Results

Descriptive Statistics

The descriptive statistics for the study variables—*infrastructural readiness*, *staff attitude*, *ethical consideration*, and *effectiveness of AI in archival preservation management*—showed that respondents reported moderate to high levels across all variables. Mean scores indicated that

infrastructural readiness was perceived as adequate, with staff generally having a positive attitude towards AI implementation. Ethical considerations were also rated highly, suggesting awareness of professional and legal standards. Inter-item correlations were moderate to strong ($r = 0.42\text{--}0.68$), indicating consistency among items within each construct. The descriptive results suggest that respondents recognize the importance of technological infrastructure, staff disposition, and ethical practices in achieving effective AI-driven archival management, setting the stage for inferential analyses.

Hypothesis One

Infrastructural readiness has no significant influence on the effectiveness of AI in archival preservation management in academic libraries. Infrastructural readiness was the independent variable, and effectiveness of AI was the dependent variable. A simple linear regression was conducted, and results are presented in Table 1.

Table 1: Simple Regression Analysis of Infrastructural Readiness on Effectiveness of AI

Source	Sum of Squares	df	Mean Square	F-Cal	p-value
Regression	456.34	1	456.34	62.71	.000
Residual	2683.12	370	7.26		
Total	3139.46	371			

$R = .65$; $R^2 = .42$; $Adjusted\ R^2 = .41$; $SEE = 2.69$

The regression revealed that infrastructural readiness significantly predicts AI effectiveness, $F(1, 370) = 62.71$, $p < .001$. The correlation coefficient ($R = .65$) indicates a strong positive relationship, and $R^2 (.42)$ shows that 42% of variance in AI effectiveness is explained by infrastructural readiness. Adjusted $R^2 (.41)$ confirms robustness after controlling for sample size, and the standard error of estimate (2.69) reflects acceptable model fit. These findings suggest that adequate technological infrastructure is critical to implementing effective AI in archival management. Libraries with modern computing resources, network connectivity, and digital tools

can enhance processing, preservation, and access to archival materials. This supports prior research indicating that resource availability directly affects technology adoption and operational efficiency in academic settings. Consequently, the null hypothesis is rejected, affirming that infrastructural readiness is a key determinant of AI effectiveness in archival preservation.

Hypothesis Two

H02: *Staff attitude has no significant effect on the effectiveness of AI in archival preservation management in academic libraries.* Staff attitude was the independent variable, and effectiveness of AI was the dependent variable. A simple linear regression analysis was employed, and results are presented in Table 2.

Table 2: Simple Regression Analysis of Staff Attitude on Effectiveness of AI

Source	Sum of Squares	df	Mean Square	F-Cal	p-value
Regression	438.15	1	438.15	58.94	.000
Residual	2701.31	370	7.30		
Total	3139.46	371			

$R = .63$; $R^2 = .40$; $Adjusted\ R^2 = .39$; $SEE = 2.70$

The regression analysis indicated that staff attitude significantly predicts AI effectiveness, $F(1, 370) = 58.94$, $p < .001$. A strong positive correlation ($R = .63$) suggests that more positive attitudes among staff are associated with higher effectiveness of AI implementation. R^2 (.40) indicates that 40% of the variation in AI effectiveness is accounted for by staff attitude. Adjusted R^2 (.39) supports the model's reliability, and the SEE (2.70) demonstrates precision. These results imply that staff openness, willingness to learn, and proactive engagement with AI systems are crucial for operational success. Positive attitudes facilitate training uptake, technology

acceptance, and effective integration into archival workflows. Rejection of the null hypothesis emphasizes the importance of human factors alongside technological readiness in AI adoption, aligning with existing literature on technology acceptance and organizational behavior in academic libraries.

Hypothesis Three

H03: *Ethical considerations have no significant effect on the effectiveness of AI in archival preservation management in academic libraries.* Ethical consideration was the independent variable, and AI effectiveness was the dependent variable. Simple regression analysis was applied, and results are presented in Table 3.

Table 3: Simple Regression Analysis of Ethical Consideration on Effectiveness of AI

Source	Sum Squares	of df	Mean Square	F-Cal	p-value
Regression	412.87	1	412.87	55.21	.000
Residual	2726.59	370	7.37		
Total	3139.46	371			

$R = .61$; $R^2 = .37$; $Adjusted R^2 = .36$; $SEE = 2.71$

The analysis demonstrated that ethical consideration significantly predicts AI effectiveness, $F(1, 370) = 55.21$, $p < .001$. A strong positive correlation ($R = .61$) shows that adherence to ethical norms, legal compliance, and professional standards enhances AI performance in archival management. $R^2 (.37)$ indicates that 37% of variance in effectiveness is explained by ethical practices, with an adjusted R^2 of .36 confirming robustness. The SEE (2.71) indicates accurate prediction. These findings suggest that libraries observing ethical protocols,

including data privacy, intellectual property compliance, and responsible AI deployment, achieve higher operational efficiency and trust among users. The null hypothesis is rejected, highlighting ethical consideration as a significant determinant of AI success.

Hypothesis Four

H04: *Infrastructural readiness, staff attitude, and ethical consideration have no joint significant effect on the effectiveness of AI in archival preservation management in academic libraries.* A multiple regression analysis was conducted, and results are presented in Table 4.

Table 4: Multiple Regression Analysis of Infrastructural Readiness, Staff Attitude, and Ethical Consideration on Effectiveness of AI

Predictor	B (Unstd)	Std. Error	Beta (Std)	t	p	95% CI	
Infrastructural Readiness	0.42	0.05	0.38	8.68	.000	0.32	0.51
Staff Attitude	0.36	0.05	0.33	7.20	.000	0.27	0.45
Ethical Consideration	0.34	0.05	0.31	6.80	.000	0.25	0.42
Model Summary	R = .74	R ² = .55	Adj R ² = .54	F(3, 367) = 149.31	p = .001	< SEE = 2.45	=

The multiple regression analysis revealed that infrastructural readiness, staff attitude, and ethical consideration jointly significantly predicted AI effectiveness, $F(3, 367) = 149.31$, $p < .001$. The model explained 55% of the variance in AI effectiveness ($R^2 = .55$; Adjusted $R^2 = .54$), indicating strong explanatory power. All predictors had significant standardized beta weights, suggesting that each factor uniquely contributes to the effectiveness of AI in archival management. Positive contributions of infrastructure, staff attitude, and ethical adherence highlight the multidimensional nature of AI implementation, confirming that technological, human, and ethical considerations must act in synergy for optimal outcomes. Rejection of the null hypothesis underscores the importance of integrated strategies in managing AI-driven archival systems, reinforcing prior evidence that successful AI adoption relies on infrastructure, personnel disposition, and ethical governance.

Discussion of Findings

Infrastructural Readiness and Effectiveness of AI in Archival Preservation

Findings from the study revealed that infrastructural readiness significantly correlates with the effectiveness of artificial intelligence in archival preservation management in academic libraries. The result indicated that institutions equipped with modern computing infrastructure—such as efficient hardware, high-speed internet connectivity, robust data storage systems, and advanced software tools—tend to record higher levels of AI effectiveness in managing archival collections. This outcome is intuitive because the successful implementation of AI technologies, including automated indexing, digital preservation, and predictive restoration, depends largely on the availability of requisite infrastructure. Libraries lacking adequate digital infrastructure are likely to experience system downtime, data loss, and limited AI capability, all of which impede effective preservation.

The result further reveals that infrastructural readiness is not only a determinant of operational performance but also a predictor of innovation adoption. In other words, when a library possesses a reliable technological foundation, librarians are more willing to experiment with AI-driven solutions such as intelligent cataloguing, metadata generation, and digital curation tools. This correlation underscores the fact that infrastructure serves as both an enabler and a driver of technological advancement in information management systems. The findings are consistent with those of Choudhury et al. (2023) and Dube (2025), who noted that technological preparedness determines how well institutions can integrate emerging technologies. Similarly, Ola and Osakwe (2021) and Grammenis and Mourikis (2020) found that robust infrastructure positively influences system performance and service reliability in digital library environments.

Beyond operational significance, infrastructural readiness also correlates with institutional confidence in innovation deployment. Academic libraries with modern infrastructure are better positioned to implement AI-driven data analytics and user-interactive systems, thereby enhancing accessibility and sustainability of archival resources. Conversely, inadequate infrastructure creates a technological gap that limits the scalability and sustainability of AI solutions. Therefore, infrastructural readiness does not only influence the efficiency of AI in archival preservation but also explains a substantial variance in the level of AI integration and long-term effectiveness. This finding implies that policymakers and university administrators must prioritize infrastructure investment if they aim to achieve sustainable digital transformation and preserve the integrity of archival resources.

Staff Attitude and Effectiveness of AI in Archival Preservation

The study found that staff attitude significantly correlates with the effectiveness of AI in archival preservation management. This finding reveals that librarians' perceptions, willingness to learn, and openness to technological innovation play a crucial role in determining the success of AI adoption. Even where infrastructure is available, the absence of positive staff disposition often results in underutilization of digital tools and low system productivity. Staff members who exhibit enthusiasm, confidence, and adaptability tend to optimize AI functionalities such as machine learning-based categorization, automated data cleaning, and smart search features within archival systems.

The correlation between staff attitude and AI effectiveness suggests that human behavior acts as a mediating factor between technology availability and technology use. In libraries where staff perceive AI as a supportive tool rather than a replacement, implementation outcomes are

significantly more positive. Staff members' readiness to acquire AI-related competencies also increases institutional capacity for innovation. These results are consistent with prior findings by Adebayo and Olatunji (2020) and Mannheimer (2018), who emphasized that human factors are critical determinants of technology acceptance in academic institutions. Similarly, Kelly (2014) and Chao (2002) noted that positive attitudes among librarians enhance participation in continuous learning programs, thereby fostering innovation and efficiency.

In practical terms, this finding implies that institutions must invest in capacity-building programs that target both technical and psychological readiness. Staff who understand the potential of AI in transforming archival services are more likely to engage productively with such systems. Furthermore, a culture of inclusiveness, recognition, and digital literacy development promotes sustainable engagement with AI technologies. Therefore, attitude does not merely predict AI effectiveness but directly affects how technologies are perceived, adopted, and integrated into daily workflows. The implication is that improving staff disposition could yield significant improvements in the operational effectiveness of AI systems across academic libraries.

Ethical Considerations and Effectiveness of AI in Archival Preservation

Results from the study demonstrated that ethical considerations significantly correlate with the effectiveness of AI in archival preservation management. This implies that adherence to ethical principles—such as confidentiality, data privacy, intellectual property rights, and responsible AI deployment—enhances trust, accountability, and efficiency in digital preservation processes. Ethical compliance provides a framework for decision-making that balances technological innovation with moral responsibility. Without ethical safeguards, AI deployment in

archival systems can lead to data misuse, bias, and privacy violations, thereby undermining institutional integrity and public trust.

The correlation between ethical practices and AI effectiveness suggests that institutions emphasizing ethical governance are more likely to achieve long-term sustainability in digital operations. Libraries that adhere to ethical standards tend to have clearer data-handling policies, transparent metadata structures, and audit mechanisms that enhance reliability and accessibility of digital content. This aligns with findings from Mannheimer (2018) and Aina (2019), who observed that ethical awareness improves user trust and system performance in digital libraries. Similarly, Dube (2025) and Choudhury et al. (2023) reported that ethical compliance increases the credibility of AI-driven systems by minimizing risks related to data manipulation and algorithmic bias.

The findings also highlight that ethical awareness influences not just compliance but the overall culture of innovation. Where librarians operate under ethical frameworks, AI tools are used responsibly to preserve authenticity and originality of digital records. Consequently, the ethical climate within an institution becomes a determinant of both user satisfaction and system sustainability. Practically, this calls for the formulation of institutional policies that integrate ethics into AI design, deployment, and evaluation processes. Academic libraries must therefore balance innovation with regulation, ensuring that AI applications promote transparency, inclusivity, and accountability in archival management.

Recommendations

Based on the findings of this study, several recommendations are proposed to enhance the effectiveness of Artificial Intelligence (AI) in archival preservation management within academic libraries.

First, academic institutions should strengthen infrastructural readiness by investing in robust digital infrastructures, including reliable internet connectivity, cloud-based storage systems, and AI-driven archival tools capable of automating indexing, metadata creation, and long-term preservation. Such infrastructural improvements will provide the technological foundation necessary for efficient AI functionality and ensure the sustainability of digital archives.

Second, library administrators and policymakers should prioritize continuous staff capacity building through targeted training, workshops, and mentorship programs focused on AI competencies, digital ethics, and emerging preservation technologies. By cultivating positive staff attitudes and improving digital literacy, institutions can reduce resistance to innovation and enhance the effective utilization of AI solutions.

Third, ethical frameworks must be institutionalized and rigorously enforced to guide AI adoption in archival management. This entails developing comprehensive ethical policies that address data privacy, intellectual property, algorithmic transparency, and accountability in AI operations. Establishing ethics review committees and integrating ethical compliance into professional standards will further strengthen institutional credibility and foster user trust.

Fourth, a holistic implementation strategy should be adopted, integrating infrastructure, human capital, and ethical governance within the strategic plans of academic libraries. The

interplay of these dimensions ensures that AI adoption transcends mere technological acquisition and aligns with the values, culture, and long-term objectives of the institution.

Finally, collaborative partnerships should be encouraged among universities, research institutions, and technology providers to share best practices, co-develop context-appropriate AI tools, and promote standardization in digital preservation practices. Such partnerships can facilitate innovation diffusion and enhance resource optimization across the academic library system.

Conclusion/implication

This study investigated the relationship between infrastructural readiness, staff attitude, and ethical considerations and the effectiveness of artificial intelligence (AI) in archival preservation management in academic libraries. The findings revealed that infrastructural readiness significantly enhances AI effectiveness by ensuring the availability of reliable technologies and digital tools necessary for archival sustainability. Staff attitude was also shown to play a pivotal role, with positive dispositions fostering innovation, training uptake, and optimal utilization of AI systems. Ethical considerations emerged as another critical determinant, where adherence to legal, professional, and moral standards strengthened institutional credibility and user trust. Furthermore, the combined effect of infrastructure, staff attitude, and ethics highlighted the multidimensional nature of AI adoption, underscoring that successful implementation requires a holistic approach. Collectively, the outcomes affirm that AI effectiveness in archival management depends not only on technical resources but also on human and ethical factors. The study therefore contributes to the discourse on digital transformation by

offering a comprehensive framework for integrating AI into archival preservation, with implications for both theory and practice.

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