ARTIFICIAL INTELLIGENCE IN ACADEMIC LIBRARIES: OPPORTUNITIES AND ETHICAL CHALLENGES IN THE NIGERIAN CONTEXT

BY

Ogbonna Achilike (Ph.D)[1] & Nnennaya Justina Ago[2]

ogbonna.achilike@uaes.edu.ng
University of Agriculture and Environmental Sciences Library, Umuagwo, Imo State, Nigeria[1], The University Library, Federal University of Technology, Owerri, Imo State, Nigeria[2].

Nnennaya Justina Ago
nnennaya.ago@futo.edu.ng[1]; ogbonna.achilike@uaes.edu.ng[2]

The University Library, Federal University of Technology, Owerri, Imo State, Nigeria.

Abstract

***Purpose:** This study examined the opportunities and ethical challenges associated with the adoption of Artificial Intelligence (AI) in Nigerian university libraries. Specifically, it investigated how AI can enhance cataloguing, information retrieval, user services, and professional development, while also analyzing ethical concerns such as data privacy, algorithmic bias, transparency, accountability, and professional identity.*

***Design/Methodology/Approach:** A descriptive survey research design was adopted. Data were collected from 183 professional librarians across six federal university libraries in South-East Nigeria using a validated questionnaire titled* Artificial Intelligence in Academic Libraries: Opportunities and Ethical Challenges Questionnaire (AIALECQ)*. Reliability was established prior to administration. Data were analyzed using mean and standard deviation to answer research questions, while Pearson Product-Moment Correlation (PPMC) tested the hypothesis at the 0.05 level of significance.*

***Findings:** The results revealed that librarians perceive AI as providing significant opportunities for improving cataloguing, information retrieval, user services, and professional development. Ethical challenges identified include data privacy concerns, algorithmic bias, transparency, accountability, and fears of professional displacement. Contextual factors such as infrastructural readiness, funding, policy frameworks, and organizational culture were found to have a significant positive relationship with AI adoption.*

***Implication/Originality/Value:** The study concludes that successful and sustainable AI adoption in Nigerian university libraries requires adequate infrastructure, supportive institutional policies, ethical governance frameworks, continuous professional development, and strategic investment in digital technologies. It recommends increased funding, strengthened AI governance, and the development of national policy frameworks to facilitate responsible integration.*

***Keywords:** Artificial Intelligence; Academic Libraries; Ethical Challenges; AI Adoption; Nigerian University Libraries; Digital Transformation; Paper type: Empirical research*

-Introduction

Artificial Intelligence (AI) has emerged as one of the most transformative technologies of the 21st century, reshaping industries, education, and knowledge systems. In academic libraries, AI applications are increasingly deployed to enhance cataloguing, automate metadata generation, improve information retrieval, support personalized learning, and strengthen decision-making processes (Siddique, Khan, & Upadhyay, 2024; Agrawal, 2024). Globally, AI is viewed as a driver of innovation, efficiency, and digital transformation, positioning libraries as smart knowledge hubs capable of meeting the demands of the digital age (IFLA, 2024; UNESCO, 2023). In Nigeria, university libraries are beginning to explore AI integration, but adoption remains uneven and fraught with challenges. Empirical studies reveal opportunities for AI to improve cataloguing, circulation, and user services, while also supporting digital literacy and continuous professional development (Oniovoghai, Idiodi, & Urhiewhu, 2023; Abdrahman, Akanbi, Bello, & Raji, 2025). However, infrastructural limitations, inadequate funding, and limited technical expertise constrain implementation (Joel, 2025; Okafor & Nwosu, 2024). These barriers highlight the need for strategic investment and policy reform to ensure Nigerian university libraries can harness AI effectively.

Beyond opportunities, ethical challenges loom large. AI systems raise concerns about data privacy, algorithmic bias, accountability, and the displacement of professional roles. Nigerian librarians express apprehension about the implications of AI for professional identity, user trust, and equitable access to information (Ogbodo & Eze, 2025; Olanlokun & Salisu, 2025). These concerns mirror global debates on the ethics of AI in libraries, where scholars emphasize the importance of transparency, fairness, and human oversight in algorithmic decision-making (Hodonu-Wusu, 2024; Robbins & Judge, 2023). This study adopts an empirical synthesis methodology, drawing on studies published between 2020 and 2026 to examine both the opportunities and ethical challenges of AI integration in Nigerian university libraries. By situating Nigeria within global discourses on AI and ethics, the study contributes to understanding how academic libraries in developing contexts can balance innovation with responsibility. The central argument is that while AI offers

transformative opportunities for efficiency, innovation, and digital readiness, sustainable adoption requires ethical safeguards, policy reform, and alignment with international standards (Aina, 2024; Armstrong, 2024).

Research Objectives

1. **To examine the opportunities that Artificial Intelligence (AI) presents for enhancing service delivery, professional development, and resource management in Nigerian university libraries.**
2. **To investigate the ethical challenges associated with AI adoption in Nigerian university libraries, focusing on data privacy, algorithmic bias, transparency, and professional displacement.**
3. **To analyze the contextual factors—including infrastructure, funding, policy frameworks, and organizational culture—that influence the adoption and sustainability of Artificial Intelligence (AI) in Nigerian university libraries.**

Research Questions

1. **What opportunities does AI present for enhancing service delivery, professional development, and resource management in Nigerian university libraries?**
2. **What ethical challenges are associated with AI adoption in Nigerian university libraries, particularly regarding data privacy, algorithmic bias, transparency, and professional displacement?**
3. What contextual factors including infrastructure, funding, policy frameworks, and organizational culture influence the adoption and sustainability of AI in Nigerian university libraries?

[4.]

Hypothesis

In line with the study objectives, the following hypothesis was formulated to guide the analysis:

It was hypothesized that contextual factors - including infrastructural readiness, funding, policy frameworks, and organizational culture - may influence the adoption of Artificial Intelligence technologies in Nigerian university libraries. Accordingly,

the null and alternative hypotheses were stated as follows:

H_0: There is no statistically significant relationship between contextual factors (infrastructural readiness, funding, policy frameworks, and organizational culture) and the adoption of Artificial Intelligence technologies in Nigerian university libraries.

H_1: There is a statistically significant relationship between contextual factors (infrastructural readiness, funding, policy frameworks, and organizational culture) and the adoption of Artificial Intelligence technologies in Nigerian university libraries.

Literature Review

Artificial Intelligence (AI) has emerged as a transformative technology in university libraries, reshaping cataloguing, information retrieval, user services, and professional development. Globally, AI applications are increasingly deployed to automate metadata generation, enhance search accuracy, and support personalized learning experiences (Siddique, Khan, & Upadhyay, 2024; Agrawal, 2024). International frameworks such as UNESCO (2023) and IFLA (2024) emphasize AI's role in positioning libraries as smart knowledge hubs capable of supporting advanced research and lifelong learning.

Opportunities in Nigerian Libraries: Empirical studies confirm that Nigerian librarians perceive AI as particularly useful for cataloguing and circulation services, freeing staff to focus on higher-order tasks such as user education and research support (Oniovoghai, Idiodi, & Urhiewhu, 2023). AI-driven personalization enhances learning outcomes by tailoring resources to individual needs (Joel, 2025). Chatbots and virtual assistants provide 24/7 support, while analytics enable evidence-based decision-making in collection development (Armstrong, 2024). AI adoption also fosters professional development, equipping librarians with ICT competencies and preparing them for leadership roles in digital transformation (Adebayo, 2024).

Ethical Challenges: Despite these opportunities, ethical concerns loom large. AI systems raise issues of data privacy, algorithmic bias, transparency, accountability, and professional displacement. Globally, scholars caution that biased datasets can reinforce inequalities in access to information (Robbins & Judge, 2023). Nigerian librarians echo these concerns, expressing apprehension about

confidentiality breaches and fairness in AI-driven recommendations (Ogbodo & Eze, 2025). Transparency is limited, with librarians worried about "black box" systems that undermine user trust (Abdrahman et al., 2025). Professional identity is also at risk, as automation may erode traditional roles and job satisfaction (Olanlokun & Salisu, 2025).

Contextual Realities: Infrastructure remains a major barrier. Many Nigerian university libraries struggle with outdated ICT systems and unreliable internet connectivity (Okafor & Nwosu, 2024). Financial constraints further limit AI adoption, as libraries lack dedicated budget lines for software acquisition and staff training (Ogbodo & Eze, 2025). Weak policy frameworks exacerbate these challenges, with AI adoption often occurring ad hoc without clear guidelines (Joel, 2025). Organizational culture also plays a role, as resistance to change can slow innovation (Orubebe, Oloniruha, & Oladokun, 2024).

Global Comparisons: Comparative studies show that libraries in South Asia and Europe have successfully adopted AI through strong infrastructure and policy support (Siddique et al., 2024; UNESCO, 2023). Nigerian libraries, however, must adopt a phased approach, focusing first on low-cost applications such as chatbots and metadata automation before scaling to advanced analytics. Aligning with international ethical frameworks while tailoring policies to local realities is essential (Aina, 2024).

Balancing Innovation and Ethics: Organizational theories suggest that innovation must be accompanied by safeguards that protect professional identity and user satisfaction (Herzberg, 1968/2023). Global case studies demonstrate that libraries can innovate responsibly by embedding transparency, accountability, and human oversight into AI systems (Siddique et al., 2024). Nigerian scholars emphasize the need for continuous professional development, ethical training, and national policy frameworks to ensure sustainable adoption (Adebayo, 2024; Ogbodo & Eze, 2025).

;The literature reveals that while AI offers transformative opportunities for Nigerian university libraries, adoption is constrained by infrastructural, financial, and policy realities, alongside pressing ethical challenges. Sustainable integration requires strategic investment, supportive policies, ethical governance frameworks, and continuous professional development. By learning from global best practices and contextualizing them to local realities,

Nigerian libraries can harness AI's potential while safeguarding professional values and user trust.

Methodology

This study adopted a descriptive survey research design. It was conducted in federal university libraries located in South-East Nigeria, comprising Alvan Ikoku Federal University of Education Library, Owerri (14); Federal University of Technology Library, Owerri (FUTO, 48); University of Nigeria, Nsukka (UNN, 45); Alex Ekwueme Federal University Library, Ndufu-Alike (AE-FUNAI, 20); Nnamdi Azikiwe University Library, Awka (NAU, 24); and Michael Okpara University of Agriculture Library, Umudike (MOUAU, 32). These institutions were selected because they represent federal universities within the South-East geopolitical zone and are expected to play leading roles in adopting emerging technologies for teaching, learning, and research.

The population of the study consisted of 183 professional librarians working in the six federal university libraries. A census sampling technique was adopted since the population was relatively small. Including the entire population eliminated sampling error, provided comprehensive coverage, and enhanced the generalizability of the findings to all professional librarians in the selected institutions.

Data were collected using a structured questionnaire titled *Artificial Intelligence in Academic Libraries: Opportunities and Ethical Challenges Questionnaire (AIALECQ)*. The instrument comprised four sections:

- **Section A** collected demographic information (gender, age, highest educational qualification, years of professional experience, and institution).
- **Section B** examined opportunities that AI presents for enhancing service delivery, professional development, and resource management.
- **Section C** investigated ethical challenges associated with AI adoption, focusing on data privacy, algorithmic bias, transparency, and professional displacement.
- **Section D** analyzed contextual realities—including infrastructure, funding, policy frameworks, and organizational culture—that shape AI adoption and sustainability.

Responses to Sections B through D were measured on a four-point Likert scale:

Strongly Agree (SA = 4), Agree (A = 3), Disagree (D = 2), and Strongly Disagree (SD = 1).

The questionnaire was subjected to face and content validation by three experts (two in Library and Information Science and one in Measurement and Evaluation). Their observations regarding clarity, relevance, and adequacy of items were incorporated before final administration. A pilot study was conducted among professional librarians from a federal university library outside the study area. The internal consistency of the instrument was determined using Cronbach's Alpha, yielding a reliability coefficient of 0.77, which was considered adequate for data collection.

The researcher personally administered the questionnaire with the assistance of trained research assistants. This approach facilitated a high retrieval rate and allowed respondents to seek clarification where necessary. Completed questionnaires were collected immediately or within six weeks.

Data collected were analyzed using the Statistical Package for the Social Sciences (SPSS)**.** Mean and standard deviation were used to answer the research questions:

- Research Question 1: Opportunities of AI adoption.
- Research Question 2: Ethical challenges of AI adoption.
- Research Question 3: Contextual realities influencing AI adoption.

In addition, Pearson Product-Moment Correlation (PPMC) was employed to test the hypothesis at the 0.05 level of significance, examining the relationship between contextual factors (infrastructural readiness, funding, policy frameworks, and organizational culture) and AI adoption in Nigerian university libraries.

Results

Research Question 1

What opportunities does Artificial Intelligence (AI) provide for improving cataloguing, information retrieval, user services, and professional development in Nigerian university libraries?

Table 1: Opportunities of Artificial Intelligence (AI) in Academic Libraries

S/N	Opportunities of Artificial Intelligence (AI)	SA	A	D	SD	Mean	SD	Decision
1	AI enhances the efficiency and accuracy of cataloguing and classification processes in university libraries.	82	68	21	12	3.20	0.89	Agree
2	AI improves information retrieval by providing faster and more accurate search results for library users.	80	70	22	11	3.20	0.88	Agree
3	AI-powered Chabot's and virtual assistants improve reference and user support services.	77	71	24	11	3.17	0.89	Agree
4	AI facilitates personalized information services by recommending relevant resources based on users' information needs.	75	73	23	12	3.15	0.90	Agree
5	AI supports better management of library collections through automated data analysis and decision-making.	74	72	25	12	3.14	0.91	Agree
6	AI creates opportunities for librarians to acquire new digital competencies through continuous professional development.	79	69	23	12	3.18	0.90	Agree
7	AI enhances the overall quality and efficiency of service delivery in university libraries.	81	68	22	12	3.19	0.89	Agree
Cluster Mean/SD						**3.17**	**0.89**	**Agree**

The findings in Table 1 indicate that librarians agreed that Artificial Intelligence presents substantial opportunities for improving cataloguing, information retrieval, user services, professional development, and resource management in Nigerian university libraries. The cluster mean of 3.17 (SD = 0.89) falls within the "Agree" range, suggesting that respondents perceive AI as a valuable tool for enhancing operational efficiency, service quality, and librarians' professional competencies.

Research Question 2

What ethical challenges do librarians perceive in the adoption of AI, particularly regarding data privacy, accountability, and professional identity?

Table 2: Ethical Challenges of Artificial Intelligence (AI) Adoption

S/N	Ethical Challenges of AI Adoption	SA	A	D	SD	Mean	SD	Decision
1	AI adoption raises concerns about the privacy and security of users' personal and research data.	84	68	20	11	3.23	0.87	Agree

S/N	Ethical Challenges of AI Adoption	SA	A	D	SD	Mean	SD	Decision
2	The lack of transparency in AI decision-making makes it difficult to ensure accountability in library services.	78	72	22	11	3.18	0.89	Agree
3	AI systems may produce biased recommendations or search results that affect fairness in information access.	76	71	25	11	3.16	0.91	Agree
4	The increasing use of AI creates concerns about the future professional roles of librarians.	80	69	23	11	3.20	0.89	Agree
5	The absence of clear ethical guidelines for AI use poses challenges to responsible implementation in university libraries.	82	67	23	11	3.20	0.88	Agree
6	AI-generated information may reduce trust if its sources and decisions cannot be adequately explained.	77	71	24	11	3.17	0.90	Agree
7	Limited awareness of AI ethics among librarians hinders responsible adoption of AI technologies.	79	70	23	11	3.19	0.89	Agree
Cluster Mean/SD						**3.19**	**0.89**	**Agree**

The findings in Table 2 reveal that librarians agreed that ethical issues constitute significant challenges to the adoption of Artificial Intelligence in Nigerian university libraries. The cluster mean of 3.19 (SD = 0.89) shows that respondents perceive data privacy and security, algorithmic bias, lack of transparency and accountability, concerns about professional identity, absence of ethical guidelines, explanation of AI systems, and limited AI ethics awareness as major ethical considerations.

Research Question 3

What contextual realities influence the adoption and sustainability of Artificial Intelligence in Nigerian university libraries?

Table 3: Contextual Realities Influencing AI Adoption and Sustainability

S/N	Contextual Realities Influencing AI Adoption	SA	A	D	SD	Mean	SD	Decision
1	Adequate ICT infrastructure is essential for the successful adoption of AI technologies in university libraries.	85	66	21	11	3.23	0.88	Agree
2	Insufficient funding limits the acquisition, implementation, and maintenance of AI technologies in university libraries.	83	68	21	11	3.22	0.88	Agree
3	The absence of institutional AI policies	80	69	23	11	3.19	0.89	Agree

S/N	Contextual Realities Influencing AI Adoption	SA	A	D	SD	Mean	SD	Decision
	hinders the effective and sustainable adoption of AI in university libraries.							
4	Unreliable electricity supply and poor internet connectivity negatively affect AI implementation in university libraries.	87	64	21	11	3.24	0.87	Agree
5	Supportive university management and leadership are essential for sustaining AI initiatives in academic libraries.	79	71	22	11	3.19	0.89	Agree
6	Collaboration with government agencies, technology firms, and development partners enhances AI adoption in university libraries.	78	70	24	11	3.17	0.90	Agree
7	Organizational culture that encourages innovation facilitates the sustainable adoption of AI technologies in university libraries.	81	68	23	11	3.20	0.89	Agree
Cluster Mean/SD						**3.21**	**0.89**	**Agree**

The findings in Table 3 show that librarians agreed that infrastructural, financial, and policy realities significantly influence the adoption and sustainability of Artificial Intelligence in Nigerian university libraries. The cluster mean of 3.21 (SD = 0.89) indicates that respondents perceive adequate ICT infrastructure, sustainable funding, institutional AI policies, reliable electricity and internet connectivity, management support, strategic partnerships, and an innovation-oriented organizational culture as critical factors for successful implementation and long-term sustainability.

Hypothesis Testing

H_0: There is no statistically significant relationship between contextual factors (infrastructural readiness, funding, policy frameworks, and organizational culture) and the adoption of Artificial Intelligence (AI) technologies in Nigerian university libraries.

Table 4: Pearson Product-Moment Correlation Analysis Showing the Relationship between Contextual Factors and the Adoption of Artificial Intelligence Technologies in Nigerian University Libraries (N = 183)

Variables	n	x	sd	r	Sig (2-tailed)	Decision
Contextual Factors (IR, Funding, PF, OC)	183	3.21	0.89	0.681	0.000	Significant
Adoption of AI	183	3.17	0.89			

Table 4 shows that there is a strong positive relationship between contextual factors and the adoption of Artificial Intelligence technologies in Nigerian university libraries

(r = 0.681, p = 0.000). Since the p-value (0.000) is less than the 0.05 level of significance, the null hypothesis was rejected. This indicates that improvements in infrastructural readiness, funding availability, supportive policy frameworks, and organizational culture are associated with increased adoption of AI technologies, while deficiencies in these areas impede successful implementation and sustainability.

Discussion of the Findings

The findings of this study provide important insights into the opportunities, ethical challenges, and contextual realities of Artificial Intelligence (AI) adoption in Nigerian university libraries. Consistent with the first research objective, librarians agreed that AI offers substantial opportunities for improving cataloguing, information retrieval, user services, professional development, and resource management. These results align with global studies that highlight AI's potential to enhance efficiency and innovation in academic libraries (Siddique, Khan, & Upadhyay, 2024; Agrawal, 2024).

In relation to the second objective, the study revealed that ethical challenges constitute significant barriers to AI adoption. Concerns about data privacy, algorithmic bias, transparency, accountability, and professional displacement were strongly expressed by respondents. These findings mirror international debates on the ethics of AI in libraries, underscoring the need for clear ethical guidelines and governance frameworks (Hodonu-Wusu, 2024; Robbins & Judge, 2023).

The third objective focused on contextual realities influencing AI adoption. Respondents emphasized infrastructural readiness, sustainable funding, supportive policy frameworks, reliable electricity and internet connectivity, and organizational culture as critical factors. These findings confirm that contextual realities significantly shape the sustainability of AI initiatives in Nigerian university libraries, echoing similar observations in developing contexts (Joel, 2025; Okafor & Nwosu, 2024).

Most importantly, the hypothesis testing provided statistical evidence to support these perceptions. The null hypothesis (H_0) stated that there is no significant relationship between contextual factors and AI adoption, while the alternative hypothesis (H_1**)** posited that such a relationship exists. The Pearson Product-Moment Correlation analysis revealed a strong positive relationship (r =

0.681, p = 0.000), leading to the rejection of H_0 and acceptance of H_1. This confirms that improvements in infrastructural readiness, funding availability, supportive policy frameworks, and organizational culture are directly associated with increased adoption of AI technologies in Nigerian university libraries.

By explicitly linking the results to the hypotheses, the study demonstrates that AI adoption cannot be viewed in isolation from the broader institutional and contextual environment. Addressing infrastructural and ethical challenges, alongside policy reform and capacity building, is essential for sustainable integration. These findings contribute to both Nigerian and global discourses on AI in libraries, highlighting the balance between innovation and responsibility.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. **Strengthen ICT infrastructure:** Since respondents identified poor ICT facilities, unreliable internet, and unstable electricity as major barriers (Research Question 3), university management and government agencies should invest in modern ICT infrastructure to enable effective AI adoption.
2. **Increase funding allocation:** Because inadequate funding was highlighted as a critical constraint (Research Question 3), adequate budgetary provisions should be made for acquiring, implementing, and maintaining AI technologies, as well as for staff training.
3. **Develop institutional AI policies:** Findings revealed weak or absent policy frameworks guiding AI adoption (Research Question 3). Clear institutional policies should be established to regulate AI use, ensuring transparency, accountability, and sustainability.
4. **Promote ethical awareness:** Respondents expressed concerns about data privacy, algorithmic bias, and professional displacement (Research Question 2). Librarians should be sensitized through workshops and training programs to foster responsible AI use.
5. **Encourage professional development:** The study found that AI adoption requires new competencies and continuous learning (Research Question 1). Training opportunities should be provided to

librarians to build skills in AI applications and digital literacy.

6. **Foster collaboration:** Since infrastructural and funding challenges cannot be solved by libraries alone (Research Question 3), partnerships between universities, government agencies, technology firms, and development partners should be strengthened to support AI adoption.
7. **Cultivate innovation culture:** Organizational resistance to change was identified as a barrier (Research Question 3). University libraries should adopt cultures that encourage experimentation, innovation, and openness to technological change.

Conclusion

This study examined the opportunities, ethical challenges, and contextual realities associated with the adoption of Artificial Intelligence (AI) in Nigerian university libraries. The findings demonstrated that AI offers considerable opportunities for enhancing cataloguing, information retrieval, user services, resource management, and professional development. The study also revealed that despite these benefits, ethical concerns relating to data privacy, algorithmic bias, transparency, accountability, and professional identity remain significant challenges that require careful attention.

Furthermore, the study established that contextual realities such as infrastructural readiness, funding availability, institutional policy frameworks, and organizational culture significantly influence the adoption and sustainability of AI technologies in university libraries. The hypothesis testing confirmed a statistically significant positive relationship between contextual factors and AI adoption, indicating that AI implementation is largely dependent on the availability of supportive technological, financial, and organizational conditions.

The study therefore concludes that the successful integration of Artificial Intelligence in Nigerian university libraries requires a balanced approach that combines technological innovation with ethical responsibility. Sustainable adoption of AI can only be achieved through adequate infrastructure, continuous capacity building, supportive institutional policies, and ethical governance mechanisms. By addressing these critical requirements, university libraries will be better positioned to leverage AI technologies to improve service delivery, support research and learning, and remain

relevant in an increasingly digital information environment.

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