(REVIEW ARTICLE)

A Review of ethical and data privacy challenges in the adoption of Artificial Intelligence Technologies in Nigerian Academic Libraries

Adeyemi Olatunbosun [1], Ogunjobi, Damilare Timothy [2, *], Adediran Inioluwa Esther [2,] Olaitan Ebenezer Oluwadare [3] and Adeshina Ganiyat olaide [4]

[1] Robinson College of Business, Georgia State University, Atlanta, Georgia, USA.
[2] Department of Computer Engineering, School of Engineering and Engineering Technology, Federal University of Technology, Akure, Ondo State, Nigeria.
[3] Department of Applied Mathematics, School of Physics, Engineering, Mathematics, and Computer Science, Delaware State University, United States.
[4] Department of Library and information science, Federal polytechnic, offa, Kwara State Nigeria.

Abstract

Artificial intelligence is rapidly reshaping information ecosystems, yet its integration into Nigerian academic libraries presents significant ethical and data privacy concerns that remain underexplored. This comprehensive review synthesizes conceptual, empirical, and policy-oriented literature to examine how AI adoption intersects with issues of fairness, accountability, transparency, and user rights in Nigeria's higher education environment. Findings reveal that while AI offers substantial opportunities to improve information access, library efficiency, and research productivity, its deployment is challenged by infrastructural constraints, limited digital literacy, evolving regulatory frameworks, and gaps in institutional capacity. Ethical risks such as algorithmic bias, opacity in automated decision-making, unclear accountability structures, and the erosion of user autonomy underscore the importance of context-sensitive governance. Data privacy vulnerabilities, particularly relating to extensive user data collection, cross-border storage, and compliance with national protection laws, further complicate safe adoption. The review highlights the absence of unified national guidelines for AI in education and calls for stronger collaboration among regulatory agencies, university administrations, and professional bodies to develop coherent governance systems. Prospects remain promising, particularly in areas of inclusive education, local AI innovation, and capacity-building among librarians. The study concludes by emphasizing the need for ethical frameworks, privacy-by-design approaches, and robust institutional oversight to ensure that AI enhances library services while safeguarding user rights.

Keywords: Artificial intelligence; Academic libraries; Ethics; Data privacy; Nigeria; Governance; Algorithmic fairness; AI policy

1. Introduction

The rapid diffusion of artificial intelligence has reshaped the operations of academic libraries worldwide. In many advanced information environments, AI tools now support activities such as intelligent search, automated metadata generation, adaptive learning systems, and user-centered information services. These developments reflect a global shift toward data-driven library management in which large language models, machine learning algorithms, and natural language processing are increasingly integrated into routine workflows. As higher education institutions pursue digital transformation, academic libraries in the Global North have become early adopters of AI-enhanced technologies that promise greater efficiency, precision, and user engagement.(Madanchian & Taherdoost, 2025).

* Corresponding author: Ogunjobi, Damilare Timothy

Within the Nigerian academic library landscape, the adoption of AI is still emerging but is steadily gaining visibility. Several university libraries are experimenting with chatbots for virtual reference services, automated cataloguing systems capable of assisting with metadata creation, and recommender systems that personalize access to digital resources. These applications demonstrate a growing recognition of the potential of AI to address longstanding challenges related to access, staffing, and service delivery. However, the pace of adoption remains uneven and is often constrained by infrastructural limitations, funding shortfalls, and varying degrees of digital readiness among librarians and users.

The integration of AI into Nigerian academic libraries also raises important ethical and data privacy concerns that require careful consideration. As AI systems depend on extensive data collection, there is an increased risk of inappropriate data handling, algorithmic bias, opaque decision-making, and potential violations of user privacy. These concerns are particularly salient in developing contexts where institutional policies, legal safeguards, and technical capacities may not yet be sufficiently robust. In such settings, ethical lapses can have broader implications for trust in educational institutions, the protection of students' digital rights, and the equitable distribution of technological benefits.(Ngulube & Vincent Mosha, 2025).

Despite the growing interest in AI-enabled library services, significant gaps persist in policy formulation, infrastructural support, and digital literacy.(Akande et al., 2025). Many academic libraries lack comprehensive internal guidelines on responsible AI use, and national regulatory frameworks are still evolving. Moreover, limited technical expertise among library personnel restricts their ability to evaluate, deploy, and manage AI systems in an ethically grounded manner. These challenges underscore the need for a systematic review that synthesizes current knowledge on the ethical and data privacy implications of AI adoption in the Nigerian academic library sector.(Edam-Agbor et al., 2025).

This review aims to examine the ethical, legal, and privacy-related issues that accompany the integration of AI technologies in Nigerian academic libraries and to identify the institutional and regulatory conditions necessary for responsible implementation. The guiding research questions explore how AI is currently being deployed, what ethical risks emerge from these deployments, and what frameworks exist or are required to safeguard user rights and institutional integrity. The review draws on peer-reviewed literature, policy documents, global standards, and regional studies to provide a comprehensive analysis of the subject. By clarifying the opportunities and challenges associated with AI adoption, the study offers insights that are relevant to library administrators, policymakers, scholars, and technology developers concerned with building sustainable and ethically aligned library ecosystems in Nigeria.

The study adopts a structured review methodology that synthesizes conceptual, empirical, and policy-oriented evidence. Its scope encompasses both the technological applications currently present in Nigerian academic libraries and the broader ethical and privacy considerations shaped by national regulations and global best practices. This introduction establishes the context for the review and highlights the urgency of addressing ethical and privacy issues as Nigerian academic libraries navigate the transition toward AI-enabled information services.

2. Conceptual and Theoretical Framework

Artificial intelligence in academic libraries refers to computational systems designed to perform tasks that ordinarily require human reasoning, interpretation, and learning. These systems operate by analyzing large information datasets, identifying patterns, and adjusting their outputs based on accumulated knowledge. In the library environment, AI supports functions such as automated metadata generation, intelligent discovery tools, virtual reference services, personalized resource recommendations, and advanced analytics for user engagement. As libraries increasingly operate within digital and hybrid ecosystems, AI has become central to efforts to enhance service quality, streamline workflows, and expand access to information.(Collins et al., 2021).

Several categories of AI technologies shape contemporary academic library operations. Machine learning enables systems to improve their performance over time, which supports automated classification, recommender systems, and predictive modelling of user needs. Natural language processing allows computers to interpret and generate human language, making it possible for users to interact with chatbots, conversational search interfaces, or semantic retrieval systems. Robotics represents a growing aspect of library automation in global contexts, although its use remains limited in Nigeria. Predictive analytics assists libraries in anticipating resource demands, identifying emerging trends in user behavior, and supporting evidence-based planning. Intelligent search systems combine behavioral data, semantic interpretation, and algorithmic ranking to deliver more accurate, context-sensitive search results.(Islam et al., 2025). Together, these technologies illustrate the conceptual scope within which AI functions in academic libraries.

The ethical assessment of these technologies is grounded in established theoretical models. Deontological ethics provides a rule-based perspective that foregrounds duties and rights. In the context of AI, it requires libraries to protect user autonomy, ensure confidentiality, and maintain transparency in system design and data handling. The utilitarian approach evaluates technologies on the basis of their overall consequences. From this standpoint, AI systems should be adopted when they maximize benefits, such as increased efficiency or accessibility, while minimizing risks, such as discrimination or privacy violations.(Powell et al., 2022). Principalism, which incorporates autonomy, beneficence, non-maleficence, and justice, provides a balanced framework for assessing whether AI systems respect user choice, deliver genuine value, avoid foreseeable harm, and promote fair access to information resources. In addition to these broad ethical theories, data-specific frameworks such as the General Data Protection Regulation, the OECD AI Principles, and UNESCO's Recommendation on the Ethics of Artificial Intelligence emphasize accountability, transparency, safety, explainability, and alignment with human rights. These frameworks serve as normative guides for managing AI systems in environments where data governance must be both robust and adaptable.(Heyder et al., 2023).

The relationships among these concepts, ethical considerations, and perceived risks are summarised in the conceptual framework presented in Figure 1

Figure 1: Conceptual Framework for Examining Ethical Issues and Perceived Risks in the Adoption of AI Technologies in Academic Libraries

This figure illustrates the cyclical and interconnected structure of the main domains that guide the safe integration of AI technologies in academic libraries. It highlights how ethical concerns, perceived risks, and patterns of scholarly discussion interact to shape the evaluation of AI adoption. The framework also underscores trust-related impacts and broader categories of risk that influence institutional decision-making.

The relevance of these theoretical perspectives to Nigerian academic libraries is considerable. Many Nigerian institutions operate in environments marked by uneven technological infrastructure, evolving regulatory mechanisms, and varying levels of digital literacy among both staff and users. Deontological principles help articulate obligations related to user privacy and data protection, particularly in contexts where students may not fully understand how their personal data is collected or processed. Utilitarian reasoning supports decision-making in situations where libraries must weigh limited resources against the potential benefits of AI-enhanced services. The principles of autonomy, beneficence, non-maleficence, and justice provide practical tools for assessing fairness, identifying potential harms, and ensuring that technological improvements are equitably distributed across diverse user groups. Global data ethics frameworks offer additional support by providing internationally recognized benchmarks that can guide responsible AI governance, especially where national standards are still developing. By integrating these conceptual and ethical perspectives, Nigerian academic libraries can pursue AI adoption in ways that are context-sensitive, legally informed, and aligned with global expectations for responsible technological innovation.(Ojobor et al., 2025).

3. Methodology of the Review

This study adopts a comprehensive review methodology structured around principles derived from both narrative and systematic review approaches. The aim is to provide an extensive synthesis of the ethical and data privacy challenges associated with the adoption of artificial intelligence technologies in Nigerian academic libraries. A comprehensive review is well-suited to emerging fields where conceptual clarity, mapping of themes, and integration of multiple forms of evidence are essential for constructing a coherent analytical foundation. This method allows for the inclusion of diverse sources while maintaining transparent and rigorous procedures for data selection, appraisal, and synthesis.

The search strategy was designed to capture scholarly and policy-relevant literature across a wide range of information sources. Searches were conducted in major academic databases, including Scopus, Web of Science, Google Scholar, and the African Journals Online platform. In addition, leading Library and Information Science journals, both international and African, were manually screened to identify relevant publications that may not be indexed in major databases. The search terms combined keywords related to artificial intelligence, academic libraries, ethics, data privacy, risks, and the Nigerian higher education context. Boolean operators and controlled vocabulary terms were used where applicable to increase sensitivity and precision. To ensure breadth and relevance, the search covered literature published between 2000 and 2024, a period that aligns with the global expansion of AI and the corresponding evolution of digital library systems.

Inclusion and exclusion criteria guided the selection of materials for review. Eligible studies were required to focus on artificial intelligence technologies within academic, digital, or research libraries; address ethical, privacy-related, or risk-oriented dimensions of AI adoption; and include content relevant to Nigeria or comparable developing-country contexts. Peer-reviewed journal articles, conference proceedings, policy documents, theses, and reports were all considered. Publications were excluded if they examined AI outside the information and library domain, did not address ethical or privacy issues, or were purely technical studies with no implications for library services or governance. Duplicate records and articles lacking substantive conceptual or empirical content were also removed.

Data extraction followed a structured process. For each included publication, key information was recorded, including author details, publication year, methodological approach, AI technologies examined, ethical or privacy concerns identified, and contextual relevance to Nigeria or similar settings. These data were then evaluated to identify recurring themes, conceptual patterns, and areas of divergence across the literature. The synthesis process employed an integrative narrative approach that allowed the combination of conceptual insights, empirical findings, and policy perspectives. Particular attention was given to how ethical frameworks, theoretical constructs, and risk classifications are applied or discussed in the literature, enabling the review to present a coherent account of scholarly perspectives and research gaps.

Through this methodology, the review aims to provide a comprehensive and analytically grounded understanding of the ethical and data privacy challenges surrounding AI adoption in Nigerian academic libraries, while also identifying areas requiring further scholarly and policy attention.

4. Current State of AI Adoption in Nigerian Academic Libraries

Digital transformation efforts within Nigerian universities have accelerated over the past two decades, driven by the expansion of internet connectivity, increased investment in institutional repositories, and the growing demand for access to digital learning resources. Many universities have shifted toward electronic library systems, online catalogues, digital collections, and remote access services as part of broader initiatives to modernize higher education. Although these developments represent important milestones, the integration of advanced technologies such as artificial intelligence remains uneven. AI adoption is emerging within a context characterized by varying levels of digital maturity, infrastructural constraints, and institutional commitment to technological innovation.(Gkrimpizi et al., 2023).

Awareness of AI among Nigerian librarians has grown considerably, particularly through professional workshops, conferences, and the increasing visibility of AI-related discourse in Library and Information Science scholarship. However, awareness does not always translate into readiness for adoption. Studies have shown that many librarians possess foundational knowledge of AI concepts but have limited hands-on experience with AI-based tools or systems. Readiness is influenced by factors such as digital literacy, confidence in using emerging technologies, access to training opportunities, and institutional support for experimentation and skill development. As a result, levels of preparedness vary considerably across institutions, with better-resourced universities typically demonstrating higher readiness than smaller or less funded institutions.(Jibga et al., 2025).

Despite these disparities, several AI tools are already in use or under consideration within Nigerian academic libraries. Chatbots and virtual reference assistants have been introduced in some institutions to support real-time user assistance and guide remote users through digital platforms. Automated cataloguing and metadata generation tools, which rely on machine learning to classify and organize information resources, are increasingly recognized as potential solutions to staffing constraints and high cataloguing workloads. Recommendation engines that support personalized access to e-resources are also being explored. Additionally, plagiarism detection software and intelligent search systems powered by natural language processing have become integral to academic integrity and research support services across many universities. While full-scale AI integration is still evolving, these early applications highlight the growing recognition of AI's role in enhancing service quality and operational efficiency.(Edam-Agbor et al., 2025).

When compared with other African countries, Nigeria's adoption trajectory displays both strengths and limitations. South Africa and Kenya, for example, have made more significant strides in deploying AI-driven educational technologies, supported by stronger digital infrastructure, national innovation policies, and higher levels of investment in research and development. Countries such as Egypt, Morocco, and Rwanda are also beginning to incorporate AI into library and educational systems as part of broader national digital transformation agendas. Nigeria, by contrast, has a large higher education sector and a rapidly growing technology ecosystem, but faces structural barriers that slow the diffusion of AI innovations. Nonetheless, Nigeria's strong research community and expanding interest in digital librarianship position the country as a potential leader in AI adoption if the existing challenges are addressed(Diallo et al., 2025).

Several obstacles continue to limit the full-scale deployment of AI in Nigerian academic libraries. Infrastructural challenges such as unstable electricity supply, limited broadband connectivity, and outdated computer systems hinder the successful implementation of AI-dependent technologies. Funding constraints restrict the ability of libraries to invest in advanced digital systems, subscription-based AI platforms, or continuous staff training. Skills gaps remain a significant barrier, as many librarians lack specialized expertise in data analytics, machine learning, or AI system administration. Institutional policy gaps further complicate matters, as many universities have not yet developed clear guidelines governing the use of AI or the management of sensitive user data. These challenges collectively contribute to a slow and uneven adoption landscape, underscoring the need for a strategic, well-supported approach to integrating AI into academic library services.(Oyeyemi et al., 2025).

Overall, while Nigerian academic libraries are making gradual progress toward AI-enabled transformation, the current state of adoption reflects both the promise of technological advancement and the persistence of systemic constraints. The extent to which AI can be effectively integrated will depend on sustained investment, capacity-building, and the development of governance structures that support responsible innovation.

5. Ethical Challenges in AI Adoption

The integration of artificial intelligence into academic library environments raises a range of ethical concerns that require careful evaluation. As AI systems begin to influence information access, decision-making processes, and user interactions, their deployment must be guided by principles that protect fairness, accountability, transparency, and user autonomy. The ethical challenges associated with AI use in Nigerian academic libraries are shaped not only by the nature of the technologies themselves but also by contextual factors such as institutional readiness, data governance practices, and societal expectations. These challenges are discussed across four core domains: algorithmic bias and fairness, transparency and explainability, accountability and responsibility, and the preservation of autonomy through meaningful human oversight.(Sousa, 2025).

5.1. Algorithmic Bias and Fairness

Algorithmic bias represents one of the most widely discussed ethical challenges in AI adoption. AI systems rely on datasets that may reflect historical inequalities, cultural assumptions, or structural patterns of exclusion. In the Nigerian context, where local datasets are limited and imported systems are commonly used, there is a heightened risk that algorithms may embed discrimination into automated decisions. Such biases can manifest in the ranking of search results, the categorization of library materials, or the tailoring of recommendations based on patterns that do not accurately reflect local academic realities.(Lendvai et al., 2025).

Cultural and contextual data gaps further intensify these risks. Many AI systems are trained on Western-centric datasets that fail to capture the linguistic diversity, academic priorities, or information-seeking behaviors of Nigerian users. This mismatch can lead to inaccurate outputs, misclassification of locally relevant content, and reduced system effectiveness. Beyond technical inaccuracies, bias has broader implications for academic integrity and equitable access to information.

If AI systems privilege certain subjects, authors, or institutions over others, they may unintentionally skew research pathways or influence learning outcomes. User experiences may also be affected when students or researchers consistently receive incomplete or biased information. Ensuring fairness requires both a critical assessment of datasets and continuous monitoring of system outputs. (Ohu et al., 2025).

5.2. Transparency and Explainability

Many AI systems operate as opaque "black boxes," producing outputs through complex and often inaccessible internal processes. This lack of transparency presents a substantial ethical challenge in academic library settings, where librarians traditionally serve as interpreters and guides to information resources. When the logic behind AI-driven recommendations or search results cannot be easily explained, librarians may find it difficult to justify decisions to users or address concerns about accuracy. This opacity undermines one of the core values of librarianship: the commitment to providing clear, understandable pathways to information.(Felicetti et al., 2025).

The inability to explain how an AI system arrives at its conclusions has consequences for user trust. Students and researchers may become sceptical of automated systems if they perceive them as unaccountable or unpredictable. In contexts where awareness of AI is still developing, the absence of clear explanations may deepen existing uncertainties about digital technologies. Promoting transparency requires institutions to choose systems that offer interpretable output, develop user-oriented communication strategies, and equip librarians with the knowledge necessary to engage critically with AI-generated results.

5.3. Accountability and Responsibility

The question of who bears responsibility when AI systems make mistakes or produce harmful outcomes is a central ethical issue. Algorithmic errors may include misclassification of resources, inaccurate recommendations, incorrect metadata generation, or privacy breaches stemming from automated data processing. Determining liability in such cases can be complex, especially when systems are supplied by external vendors or built on proprietary models whose internal workings are not disclosed.

Nigerian academic libraries often lack formal AI governance structures that could allocate responsibility, monitor risks, or establish procedures for responding to ethical breaches. Without clear institutional policies, issues such as bias detection, system auditing, or data protection may fall through administrative gaps. The establishment of ethical review boards or compliance offices within universities could help address these challenges by providing oversight, guiding procurement decisions, and ensuring that AI systems align with institutional values and legal mandates. Robust governance is essential to minimize harm and uphold professional accountability.(Enabulele, Ojo, et al., 2025; Matsieli et al., 2025).

5.4. Autonomy and Human Oversight

The introduction of automation raises concerns about the preservation of professional autonomy and the safeguarding of human decision-making authority. AI tools may alter traditional workflows in ways that shift responsibilities or diminish the role of human judgment. Librarians may experience uncertainty about their professional identity as routine tasks become automated or as AI-generated outputs influence practices such as reference services, collection management, or information literacy instruction. It is essential to strike a balance between efficiency gains and the preservation of human expertise.(Machucho & Ortiz, 2025).

Ensuring meaningful human oversight is fundamental to ethical AI deployment. Librarians must retain the ability to interpret system outputs, question automated decisions, and intervene when necessary. Overreliance on AI may lead to deskilling or blind trust in algorithmic outputs, while insufficient oversight increases the risk of uncorrected errors. Maintaining user autonomy also requires that students and researchers understand how AI shapes their interactions with information resources and retain the agency to navigate systems independently. Human oversight thus functions as a safeguard for both professional responsibility and user protection.

6. Data Privacy and Security Challenges

The adoption of artificial intelligence in academic libraries introduces significant data privacy and security concerns that extend beyond technical considerations. AI systems depend on continuous data collection, algorithmic processing, and integration with external platforms, all of which create vulnerabilities that must be addressed through robust governance frameworks. (Olaitan et al., 2025). In the Nigerian academic context, where data protection cultures and digital literacy vary widely, these challenges take on an added layer of complexity. This section examines four major

areas of concern: user data collection, compliance with national data protection laws, data storage and third-party risks, and issues relating to digital literacy and informed consent. (Matsieli et al., 2025).

6.1. User Data Collection and Surveillance Concerns

AI-enabled library systems often rely on extensive data collection to personalize services, optimize retrieval processes, and improve system performance. The data gathered may include usage patterns, search histories, access logs, learning behaviors, and, in some cases, sensitive personal identifiers. While such data can support enhanced user experiences, it also introduces concerns related to surveillance and the potential erosion of user privacy. In academic settings—where intellectual freedom, anonymity, and unfettered access to information are core values—constant monitoring threatens to undermine trust between users and library systems.(Madanchian & Taherdoost, 2025).

Ethical implications arise when users are not adequately informed about the nature, extent, and purpose of data collection. In environments where AI systems operate invisibly in the background, users may be unaware that their behaviors are being tracked, analyzed, or stored for long periods. This lack of transparency raises questions about autonomy, consent, and the responsible stewardship of personal information. It is particularly problematic in Nigerian academic libraries, where awareness of data rights remains limited, and privacy policies are often incomplete or inconsistently implemented.

6.2. Compliance with Nigerian Data Protection Laws

Nigeria has made notable progress in formalizing data protection through the Nigeria Data Protection Regulation (NDPR) and the more recent Nigeria Data Protection Act (NDPA 2023). These legal instruments outline principles relating to lawful processing, purpose limitation, data minimization, security safeguards, and user rights. For AI-driven systems in academic libraries, compliance with these regulations is essential for ensuring ethical data processing and protecting users from harm.

Despite these frameworks, significant gaps in enforcement and institutional readiness persist. Many universities lack dedicated data protection officers or formalized compliance structures. Internal policies relating to AI, digital privacy, or cyber governance are often underdeveloped or absent. Limited awareness of legal obligations among staff further complicates compliance efforts. As a result, even when libraries deploy AI systems with good intentions, they may inadvertently violate key provisions of national data protection law. Strengthening institutional capacity is therefore crucial for ensuring that AI adoption aligns with legal and ethical standards.

6.3. Data Storage, Access, and Third-Party Risks

AI systems used in academic libraries are frequently hosted on cloud-based platforms, many of which rely on external vendors or involve cross-border data transfers. These arrangements introduce risks related to data sovereignty, contractual oversight, and jurisdictional uncertainty. When data is stored outside Nigeria, it may be subject to foreign privacy laws or exposed to conditions that offer weaker protections than national standards. This raises complex questions about who has access to user information and under what circumstances.(Jibga et al., 2025).

Data breaches and cyberattacks pose additional threats. Libraries are attractive targets due to the volume of personal and academic data they hold. A breach involving AI-managed systems could expose sensitive information and compromise the integrity of institutional digital environments. Even without malicious intent, improper system configurations or inadequate security protocols may lead to unauthorized access or misuse. Nigerian academic libraries, many of which operate with limited cybersecurity infrastructure, are particularly vulnerable to such risks. Ensuring secure storage, rigorous access protocols, and strong vendor agreements is therefore essential for safeguarding user data.(Enabulele, Omo-Enabulele, et al., 2025).

6.4. Digital Literacy and User Consent Issues

Effective protection of user data requires not only technical safeguards but also informed engagement from users. In many Nigerian universities, digital literacy levels vary widely, and students may have a limited understanding of how AI systems function or how their data is processed. This creates challenges for obtaining meaningful consent, as users cannot fully evaluate the implications of agreeing to data collection practices they do not understand(Adeleke et al., 2025).

Low awareness of digital rights makes students more vulnerable to exploitation or unintentional exposure. Privacy policies may be overlooked or misunderstood, particularly when written in technical or legal language that is difficult for users to interpret. These challenges highlight the ethical responsibility of academic libraries to communicate clearly,

provide accessible information about AI systems, and offer opportunities for users to opt out where possible. Improving digital literacy is, therefore, a crucial component of ethical data handling and responsible AI deployment. (Eleje et al., 2025; Shehu et al., 2025).

7. Governance, Policy, and Regulatory Issues

The successful adoption of artificial intelligence in Nigerian academic libraries depends not only on technological capacity but also on the strength of governance structures, institutional policies, and regulatory frameworks. As AI systems become more integrated into academic environments, their ethical, legal, and operational implications necessitate coordinated oversight. However, the governance landscape surrounding AI in Nigeria remains fragmented, and many institutions lack the policies required to ensure responsible and accountable implementation. This section examines the major governance and regulatory challenges shaping AI adoption in Nigerian academic libraries.(Shehu et al., 2025).

A key difficulty arises from the absence of unified national guidelines specifically addressing the use of AI in educational institutions and libraries. While Nigeria has made progress in developing data protection regulations and issuing broader national AI policy drafts, these instruments do not offer detailed directives for academic environments. As a result, institutions often interpret general regulations independently, leading to inconsistent practices in procurement, data handling, system evaluation, and risk management. Without clear national standards tailored to the educational sector, libraries face challenges in aligning AI adoption with ethical expectations and legal requirements.(Edam-Agbor et al., 2025).

Institutional policy gaps further complicate the governance landscape. Many Nigerian universities lack comprehensive data management policies, privacy frameworks, or dedicated AI governance guidelines. Where policies exist, they are often outdated or limited in scope, failing to address issues such as algorithmic accountability, user consent mechanisms, ethical oversight structures, or procedures for monitoring AI performance. The absence of robust internal frameworks leaves significant room for inconsistencies in practice, making it difficult to enforce responsibilities or ensure compliance with national regulations. In addition, libraries frequently rely on vendor systems without having institutional policies that specify how such tools should be assessed, monitored, or integrated into academic workflows.(Juma & Faturoti, 2025).

Addressing these governance gaps requires strong collaboration among key national bodies and professional associations. Agencies such as the National Information Technology Development Agency play a central role in regulating data protection and shaping Nigeria's emerging AI governance landscape. The Nigerian Library Association, as the leading professional body for librarians, is well-positioned to translate national guidelines into sector-specific standards and professional practice codes. The National Universities Commission also has a critical role in integrating AI governance into accreditation processes and academic quality assurance. Effective coordination among these bodies, alongside university administrations, is essential for developing a coherent and sustainable governance framework that supports responsible AI adoption.(Juma & Faturoti, 2025).

Ethical procurement and vendor management represent additional governance concerns. AI systems used in libraries are often developed by external vendors whose algorithms, data practices, and long-term service commitments may not be transparent. This introduces risks related to data ownership, algorithmic fairness, vendor dependency, and the long-term sustainability of AI tools.(Enabulele, Eleweke, et al., 2025). Ethical procurement requires institutions to critically evaluate vendors' data protection policies, audit mechanisms, system transparency, and contractual terms governing data access and storage. Libraries must ensure that procurement decisions are guided by ethical principles rather than solely by cost or convenience. Establishing clear contractual protections, due diligence procedures, and ongoing vendor monitoring can help mitigate risks and protect user interests.(Pesqueira et al., 2024).

In overview, governance, policy, and regulatory challenges remain significant barriers to the responsible deployment of AI in Nigerian academic libraries. Yet these challenges also present opportunities for institutional strengthening, professional collaboration, and the development of context-responsive frameworks. Building a coherent governance ecosystem anchored in national guidelines, strong institutional policies, and ethical procurement practices is essential for ensuring that AI adoption enhances academic library services while safeguarding user rights and institutional integrity(Kim & Adeleke, 2025).

8. Opportunities and Future Prospects

Despite the ethical, infrastructural, and regulatory challenges associated with artificial intelligence, the integration of AI technologies into Nigerian academic libraries presents substantial opportunities for strengthening information services and advancing the broader goals of higher education. As universities continue to expand their digital ecosystems, AI offers transformative possibilities for enhancing access to knowledge, improving institutional efficiency, and supporting inclusive learning. These opportunities, combined with emerging global best practices and growing professional interest in AI, signal a promising future for AI-enabled library services in Nigeria.(Suleiman et al., 2024).

AI holds significant potential to improve information access and research productivity. Intelligent search systems can provide more accurate and context-aware retrieval of resources, reducing the time users spend navigating databases and catalogues. Recommendation engines can help students and researchers discover relevant materials that align with their academic needs, thereby strengthening research outputs. Automated metadata generation and classification tools can streamline cataloguing processes, allowing librarians to redirect attention from routine tasks to more specialized roles such as research support, instruction, and digital curation. AI-driven analytics also enable libraries to gain deeper insights into user behavior, resource usage patterns, and emerging research trends, which can inform evidence-based decision-making and strategic planning.(Animashaun et al., 2025; Faiyazuddin et al., 2025).

AI also has a key role in supporting inclusive education. Assistive technologies powered by AI, such as text-to-speech systems, speech-to-text applications, adaptive interfaces, and tools that interpret or translate complex texts, enhance access for users with visual impairments, learning disabilities, or language barriers. In multilingual contexts like Nigeria, AI-powered translation tools can facilitate access to resources in local and international languages, promoting equitable participation in academic activities. By enabling more personalized and accessible learning environments, AI contributes to the creation of library services that are responsive to the diverse needs of the student population.(Fitas, 2025).

Nigeria can also benefit from global best practices in AI adoption across the library and educational sectors. Countries that have advanced in AI deployment highlight the importance of ethical guidelines, transparent governance frameworks, and strong partnerships between libraries, technology firms, and academic institutions. International initiatives such as AI readiness toolkits, open-source algorithms, standards for explainability, and assessment frameworks for algorithmic risk provide models that Nigerian libraries can adapt to local contexts. Collaborative networks, including regional and international consortia, offer additional avenues for knowledge exchange, benchmarking, and shared learning.(Adewojo et al., 2025).

Realizing the opportunities presented by AI requires sustained capacity-building among Nigerian librarians. Professional development initiatives should focus on strengthening digital literacy, data management skills, and foundational knowledge of AI concepts. Training in areas such as machine learning basics, algorithmic auditing, ethical evaluation, and vendor assessment will equip librarians to engage critically with AI tools and to participate in institutional decision-making. Universities and library associations can support this process through workshops, certifications, curriculum enhancements, and collaborative learning platforms. Building local expertise is essential not only for effective AI adoption but also for ensuring that systems are designed and managed in ways that reflect the cultural and pedagogical needs of Nigerian academic communities.(Adewojo et al., 2025).

In sum, the future of AI in Nigerian academic libraries is marked by considerable promise. With strategic investment, strong governance, and sustained professional development, AI can contribute meaningfully to the improvement of library services, the advancement of research, and the promotion of inclusive, high-quality education. Harnessing these opportunities will position Nigerian academic libraries as active participants in global technological innovation while responding to the specific needs and aspirations of local learners and researchers.

To further strengthen the strategic positioning of Nigerian academic libraries for responsible and future-oriented AI adoption, Table 1 presents a synthesized framework of key readiness dimensions that complement the opportunities discussed above."

Table 1 New Conceptual Contribution: Strategic Readiness Dimensions for Ethical AI Adoption in Academic Libraries

Readiness Dimension	Key Components	Why It Matters for Ethical AI Adoption
Technical Readiness	System interoperability, cybersecurity maturity, and infrastructure resilience	Ensures AI can operate reliably without creating additional security or privacy vulnerabilities.
Organisational Readiness	Leadership support, funding stability, and institutional policy frameworks	Determines whether AI adoption is sustainable and aligned with institutional values.
Human Capacity Readiness	AI literacy, data stewardship skills, and change-management competence	Minimises misuse of AI and empowers librarians to maintain meaningful oversight.
Ethical Readiness	Ethical risk assessment tools, algorithmic auditing practices	Helps institutions identify and mitigate bias, discrimination, and opacity in AI systems.
Regulatory Readiness	Compliance with NDPR/NDPA, vendor governance, and contractual safeguards	Reduces legal exposure and strengthens accountability in AI procurement and deployment.

9. Recommendations

The adoption of artificial intelligence in Nigerian academic libraries requires a strategic, ethically grounded, and contextually informed approach. Based on the ethical, privacy, and governance issues identified in this review, several recommendations are proposed to guide institutions, policymakers, and professional bodies in ensuring responsible and sustainable AI integration.

First, it is essential to develop context-sensitive AI ethics guidelines tailored specifically to academic libraries in Nigeria. Such guidelines should reflect local cultural, legal, and infrastructural realities while aligning with global standards for transparency, fairness, and accountability. These guidelines would provide practical direction on issues such as algorithmic auditing, user privacy, data stewardship, and ethical system deployment. The Nigerian Library Association could anchor this effort by working with university libraries and national regulatory bodies to produce sector-specific ethical frameworks.

Strengthening institutional compliance with the Nigeria Data Protection Regulation and the Nigeria Data Protection Act is equally important. Comprehensive staff training is needed to ensure librarians understand both the legal obligations and practical requirements of compliant data handling. This includes training in informed consent processes, secure data management practices, and risk mitigation strategies. Building internal capacity will help institutions meet regulatory standards and protect users from privacy violations.

The adoption of privacy-by-design principles should be prioritized in the development, procurement, and deployment of AI systems. Privacy-by-design requires that data protection considerations are embedded from the earliest stages of system development and remain central throughout the system's lifecycle. This approach encourages minimization of data collection, secure storage, clear purpose limitation, and transparent communication of system operations. Implementing these principles will help libraries balance technological innovation with ethical obligations to users.

Universities should also establish AI ethics committees or integrate AI oversight into existing ethical review structures. These committees would monitor AI implementations, evaluate vendor proposals, review data management practices, and ensure alignment with institutional values and national regulations. Dedicated oversight bodies provide an avenue for addressing ethical challenges proactively rather than reactively, thereby reducing institutional risk and enhancing accountability.

Multi-stakeholder collaboration is critical for policy harmonization and sustained progress. Regulatory agencies such as NITDA, professional bodies like the Nigerian Library Association, and higher education regulators such as the National Universities Commission must work together to develop coherent national frameworks for AI adoption in education. Collaboration with technology developers, civil society organizations, and international research networks will further enhance knowledge exchange and support evidence-informed policymaking.

Investment in digital infrastructure and cybersecurity is also necessary to ensure the safe and effective use of AI. Reliable power supply, high-speed connectivity, secure servers, and robust cyber-protection systems form the foundation upon which AI-enabled services can be built. Without these investments, even the most well-designed AI systems will fail to deliver their intended benefits or may expose institutions to significant security risks.

Finally, encouraging local AI research and the creation of indigenous datasets will help reduce algorithmic bias and improve system relevance. Nigerian academic libraries, in collaboration with university research units, can contribute to developing datasets that reflect local languages, scholarly priorities, and user behaviors. Supporting local research and innovation will reduce dependence on imported systems that may not be culturally or contextually appropriate and will help foster technological solutions that meet the specific needs of Nigerian learners and researchers.

Collectively, these recommendations provide a comprehensive pathway for strengthening the ethical, legal, and operational foundations of AI adoption in Nigerian academic libraries. Implementing them will support safer, more equitable, and more impactful integration of AI technologies across the higher education sector.

10. Conclusion

This review has examined the ethical and data privacy challenges associated with the adoption of artificial intelligence technologies in Nigerian academic libraries, highlighting the interplay between technological advancement, institutional capacity, and responsible governance. The findings indicate that while AI offers considerable potential to enhance information access, operational efficiency, and user support, its adoption raises significant concerns related to algorithmic bias, transparency, accountability, user autonomy, and data protection. These challenges are compounded by infrastructural limitations, uneven digital literacy levels, fragmented governance structures, and insufficient alignment between institutional practices and national regulatory frameworks.

The analysis reaffirms the urgent need for ethically grounded and privacy-conscious AI deployment within academic library settings. Ensuring fairness, accountability, and respect for user rights must be central to AI adoption strategies, particularly in contexts where students and researchers may be vulnerable to the unintended consequences of opaque or poorly regulated technological systems. The principles of responsible innovation, transparency, informed consent, equitable access, and robust oversight should guide the development, procurement, and implementation of AI tools across Nigerian universities.

The implications of this review extend to library leaders, policymakers, and educators. Library administrators must prioritize ethical decision-making, invest in staff training, and foster environments that support critical engagement with emerging technologies. Policymakers, including national regulatory agencies and professional associations, have a vital role in developing clear guidelines, harmonizing policies, and fostering collaboration across sectors. Educators and academic institutions must integrate AI literacy into curriculum and training programmes to equip both staff and students with the knowledge required to navigate AI-enhanced learning environments responsibly.

Future research is essential to deepen the understanding of AI's impact on Nigerian academic libraries. Studies exploring user perspectives, patterns of interaction with AI systems, and the experiences of diverse student populations will provide valuable insights into practical and ethical challenges. System audits and algorithmic assessments are needed to evaluate fairness, accuracy, and accountability in deployed AI tools. Longitudinal studies examining the sustained effects of AI adoption on library operations, user behavior, and institutional policy will further enrich the evidence base for responsible innovation.

In summary, while AI presents transformative opportunities for Nigerian academic libraries, its successful and ethical integration depends on deliberate planning, strong governance, and ongoing scholarly engagement. By addressing current challenges and investing in sustainable capacity-building, libraries can harness AI in ways that strengthen their contributions to knowledge creation, teaching, research, and the broader goals of higher education.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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