



The Adoption of Artificial Intelligence Technologies in Academic Libraries: Challenges and Prospects for Sustainable Information Services

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Abstract

The convergence of artificial intelligence with academic library practice represents one of the most consequential technological intersections in the history of information services. Globally, AI tools, including chatbots, machine learning cataloguing systems, recommendation engines, natural language processing (NLP) interfaces, intelligent search systems, and generative AI platforms, are progressively reshaping how academic libraries acquire, organise, preserve, and deliver information to scholars, students, and researchers. Yet the pace and equity of this transformation are deeply uneven: while leading institutions in North America, Europe, and parts of the Asia-Pacific are rapidly integrating sophisticated AI capabilities into their core service workflows, academic libraries in developing regions and particularly in sub-Saharan Africa, including Nigeria, face structural barriers that limit meaningful AI adoption and risk deepening the information access divide. This study examines the adoption of artificial intelligence technologies in academic libraries, with specific attention to the challenges and prospects for achieving sustainable information services. Grounded in four theoretical frameworks such as the Technology Acceptance Model (TAM), Diffusion of Innovations Theory, Socio-Technical Systems Theory, and Responsible AI Theory, and drawing on



a systematic review of peer-reviewed scholarship, policy frameworks, and institutional assessments published between 2020 and 2025, the study identifies and analyses the major strengths and weaknesses of AI in academic library settings, evaluates the policy frameworks governing AI deployment, and assesses the implications of AI adoption for information service sustainability. Findings reveal that while AI offers transformative prospects, including enhanced information retrieval, personalised user services, automated cataloguing, improved accessibility, and operational efficiency, its adoption is constrained by significant challenges including inadequate digital infrastructure, funding deficits, acute AI literacy gaps among library professionals, algorithmic bias and ethical risks, data privacy concerns, workforce displacement anxieties, and the absence of institution-specific AI governance policies. The study advances eight evidence-based policy recommendations for enabling sustainable, equitable, and ethically governed AI adoption in academic libraries.

Keywords: Artificial Intelligence (AI), Academic Libraries, Adoption Barriers, Information Access Divide, Responsible AI Governance

1.1 Introduction

Artificial intelligence, once the exclusive domain of computer science laboratories and technology corporations, has, in the opening decades of the twenty-first century, permeated virtually every sector of human endeavour, from healthcare and agriculture to finance, governance, and education. The library and information science (LIS) sector has not been exempt from this transformation. Indeed, academic libraries, as institutions whose fundamental mission is the organised management and equitable dissemination of information, stand at the centre of AI's most significant implications for knowledge work, scholarly communication, and educational access.

The integration of AI into academic library practice is neither entirely new nor a sudden disruption. The roots of AI-enabled library services can be traced to the early 1990s with the development of automated library management systems, intelligent search interfaces, and computer-assisted cataloguing tools. However, the pace and depth of AI integration accelerated dramatically from 2020 onwards, driven by three concurrent developments including the maturing of large language models (LLMs) and generative AI tools, most visibly represented by OpenAI's ChatGPT (launched in November 2022), Google's Bard/Gemini, and Anthropic's Claude, which transformed the possibilities for



natural language interaction in reference services, the proliferation of cloud computing infrastructure that made AI-powered applications accessible to institutions without specialist AI development capacity, and a growing global consensus among library leaders that AI fluency is becoming a professional necessity rather than an optional competency (Borgohain et al., 2024; Learn and Work Ecosystem Library, 2025).

A systematic literature review by researchers published in ScienceDirect in December 2025, covering 29 peer-reviewed articles from 2020 to 2024, identified six major domains in which AI has been deployed in academic libraries: technical services, reference and information services, administrative services and circulation, collection development, information literacy and user education, and professional development and collaboration (ScienceDirect, 2025). A global survey conducted by OCLC Research (2025) found that approximately 28 per cent of academic libraries surveyed had active AI implementations by early 2025, up from roughly 10 per cent in early 2023, a nearly threefold increase in under two years. These figures represent the expanding frontier of AI adoption in the sector.

Yet behind these aggregate trends lie profound inequalities. In Nigeria, home to over 170 accredited universities and one of Africa's largest higher education systems, the AI adoption landscape in academic libraries is characterised by awareness significantly exceeding implementation. A 2023 survey of academic librarians who attended the Nigerian Library Association (NLA) conference in Akure, Ondo State, found that while 80 per cent of respondents were aware of AI and machine learning (ML) tools, 100 per cent reported that AI had not yet been formally adopted in their surveyed libraries (ASRIC, 2025). Security scanning devices and library websites with basic chatbot features were identified as the most commonly available technology approximations to AI. This gap between awareness and adoption reflects the structural constraints of inadequate funding, poor infrastructure, electricity supply deficits, and acute AI literacy gaps that characterise the operating environment of most Nigerian academic libraries. This study critically examines this landscape. It asks not simply whether academic libraries are adopting AI but under what conditions, with what benefits and risks, on what policy foundations, and with what implications for the sustainability of information services, particularly in the developing world context.

1.2 Statement of the Problem

Despite the rapid global expansion of AI tools and their growing deployment in library services, the adoption of AI technologies in academic libraries, particularly in developing



country contexts, remains constrained by a complex matrix of institutional, technical, ethical, and human capital challenges that threaten to exclude information-poor institutions and communities from the developmental benefits of AI-enhanced services. This study identifies five interconnected problems that define the current crisis of AI adoption in academic libraries.

First, the infrastructure and resource divide is severe and deepening. While academic libraries in well-resourced institutions in the Global North are actively deploying sophisticated AI capabilities, including LLM-powered reference chatbots, AI-driven metadata generation systems, and predictive analytics for collection development, the majority of academic libraries in sub-Saharan Africa, including Nigeria, lack the basic ICT infrastructure, reliable electricity, high-bandwidth internet connectivity, and financial resources required for meaningful AI adoption. This resource asymmetry risks entrenching a two-tier global information ecosystem in which AI benefits accrue primarily to institutions already privileged with superior resources.

Second, the human capital deficit is acute. Research consistently documents that library professionals in Nigerian and other African universities have limited AI literacy, defined as the ability to understand, evaluate, and effectively use AI tools, and lack the training, skills, and institutional support needed to govern AI deployment ethically and effectively. A survey of academic library staff in the United States found moderate AI literacy but very limited practical experience and identified training and ethical-use guidance as the two most critical needs. If AI literacy is inadequate in well-resourced library systems, the deficit in under-resourced contexts is more acute.

Third, the ethical and policy governance landscape for AI in libraries is underdeveloped. Academic libraries deploying AI tools face a complex landscape of ethical risks: algorithmic bias that can produce discriminatory search results and resource recommendations; data privacy violations arising from the collection and processing of patron behaviour data; lack of transparency about how AI systems make decisions; and the risk of eroding intellectual freedom through AI-mediated information gatekeeping. Most academic libraries, and particularly those in developing countries, have not developed institution-specific AI ethics policies or governance frameworks that would provide guidance on navigating these risks responsibly.

Fourth, the impact of AI on the library workforce and specifically on the professional identity, roles, and employment security of librarians raises profound questions that institutional and professional leadership has not yet adequately addressed. Generative AI tools that can perform many traditional reference, cataloguing, and user



instruction functions create legitimate concerns about occupational displacement, the devaluation of professional expertise, and the transformation of librarianship into a purely technical management role. These concerns, if not proactively managed, can generate resistance to AI adoption that undermines the sector's ability to realise AI's genuine benefits.

Fifth, the sustainability of AI-enhanced library services is uncertain. AI tools require ongoing financial investment for licences, updates, and infrastructure maintenance; continuous human capacity development to keep pace with rapid technological change; and institutional governance mechanisms to ensure that AI deployment remains aligned with core library values of equity, access, and intellectual freedom. In the context of chronically underfunded academic libraries in developing countries, the long-term sustainability of AI adoption is a serious concern that the literature has not yet adequately examined.

1.3 Scope of the Study

This study focuses on the adoption of artificial intelligence technologies in academic libraries, with primary attention to university libraries globally and with specific reference to the African and particularly Nigerian context where relevant. The temporal scope encompasses the period from 2020 to 2025, during which the most transformative developments in AI capabilities (including the emergence of large language models and generative AI), global AI adoption in libraries, and the Nigerian AI policy landscape have occurred.

Thematically, the study covers six domains: (i) the nature and typology of AI technologies being deployed or considered for deployment in academic libraries; (ii) the policy frameworks governing AI adoption in library settings at the national and institutional levels; (iii) the strengths and positive outcomes of AI adoption for information service delivery; (iv) the challenges, weaknesses, and risks of AI adoption; (v) the implications of AI adoption for the sustainability of information services; and (vi) the prospects for equitable and responsible AI adoption in academic libraries, particularly in developing country contexts.

The study relies exclusively on secondary data and does not include primary field surveys. It draws on evidence from multiple geographic contexts including Nigeria, Ghana, Kenya, South Africa, China, the United Kingdom, Taiwan, and the United States, to provide a comparative perspective that enriches its analytical conclusions while keeping the Nigerian and African academic library context as its primary analytical reference point.



1.4 Significance of the Study

This study makes contributions at multiple levels that establish its significance to the scholarly, professional, and policy communities in library and information science.

Academically, the study enriches an emerging but rapidly growing body of literature on AI in academic libraries by providing an integrated analytical framework that simultaneously addresses AI's strengths, weaknesses, policy implications, and sustainability prospects – perspectives that existing studies have tended to examine in isolation rather than in combination. The study's particular emphasis on the developing country and specifically Nigerian context fills a gap in the predominantly global-north-focused literature on library AI adoption. The scoping review by Dale and colleagues (2024), published in *College and Research Libraries*, confirmed that Nigeria provided the bulk of studies on ethical and safe AI integration in academic libraries, demonstrating the centrality of the Nigerian context to this emerging research field.

For library administrators, university management, and information professionals, the study provides a structured, evidence-based analysis of the conditions, governance frameworks, and institutional investments required to adopt AI in ways that are sustainable, equitable, and aligned with core library values. For national policy bodies including the National Universities Commission (NUC), the National Information Technology Development Agency (NITDA), the Nigeria Data Protection Commission (NDPC), and the International Federation of Library Associations and Institutions (IFLA), the study provides evidence for the gaps between policy aspiration and institutional reality in AI governance and for the targeted interventions required to close those gaps.

For library and information science educators, the study identifies the AI literacy competencies that professional training programmes must integrate to prepare future librarians for the AI-embedded information environment they will inhabit. For funding agencies and development partners, the study provides an evidence base for targeted investment in AI capacity building for academic libraries in developing countries.

1.5 Objectives of the Study

This study is designed to achieve the following specific objectives:

- i. To identify and assess the typology of artificial intelligence technologies currently being adopted or considered for adoption in academic libraries globally and in the Nigerian context.



- ii. To evaluate the strengths and positive outcomes of AI adoption for academic library services, including improvements in information retrieval, cataloguing, user services, accessibility, and operational efficiency.
- iii. To analyse the challenges, weaknesses, and risks of AI adoption in academic libraries, encompassing infrastructural, human capital, ethical, governance, and sustainability dimensions.
- iv. To examine the policy frameworks including both national and institutional governing AI adoption in academic library settings and assess their adequacy and implementation effectiveness.
- v. To determine the prospects for sustainable, equitable, and ethically governed AI adoption in academic libraries and to advance evidence-based policy recommendations for achieving those prospects.

1.6 Research Questions

This study is guided by the following research questions:

- i. What is the current state of AI technology adoption in academic libraries, and which specific AI tools and applications are most widely deployed or under active consideration?
- ii. What are the documented strengths and positive outcomes of AI adoption for academic library information services?
- iii. What are the principal challenges, institutional weaknesses, and ethical risks associated with AI adoption in academic libraries, and how do these manifest differently across resourced and under-resourced institutional contexts?
- iv. To what extent do existing national and institutional policy frameworks adequately govern the ethical, equitable, and sustainable adoption of AI in academic library settings?
- v. What conditions, governance frameworks, and strategic investments are most critical for enabling sustainable AI adoption in academic libraries, particularly in developing country contexts?

2. Review of Related Literature

2.1 The Evolution of AI in Academic Libraries: A Global Overview

The history of AI in academic libraries is longer and more nuanced than the recent surge of interest in generative AI might suggest. Automated library management systems that



used rule-based expert system logic to support cataloguing and circulation management were deployed from the 1980s onwards. The development of OPAC (Online Public Access Catalogue) systems in the 1990s introduced early forms of computerised information retrieval. By the 2000s, more sophisticated recommendation algorithms drawing on techniques from machine learning were being incorporated into library discovery systems, while natural language processing was being applied to full-text search and query expansion.

The contemporary phase of AI adoption in academic libraries is distinguished by three characteristics: the accessibility of general-purpose AI tools that do not require specialist AI development capacity; the conversational and generative capabilities of large language models that enable new forms of natural language interaction between users and information systems; and the growing institutionalisation of AI within core strategic planning frameworks of leading academic libraries. A study of AI adoption trajectories across Association of Research Libraries (ARL) member institutions found that active AI implementations grew from 10 per cent of respondents in early 2023 to approximately 28 per cent by early 2025, with more than 60 per cent of respondents expressing positive or broadly positive attitudes toward AI (Lo and Vitale, cited in Learn and Work Ecosystem Library, 2025).

2.1.1 AI Adoption in Nigerian and African Academic Libraries

The AI adoption landscape in Nigerian academic libraries is characterised by a significant gap between awareness and implementation, shaped by structural constraints that distinguish the Nigerian context from more resourced international environments. A 2023 study of librarians in Northern Nigeria found near-universal awareness of AI and machine learning concepts, but 100 per cent of respondents reported that AI had not been formally adopted in their surveyed institutions, with security scanning devices being the only AI-adjacent technology commonly available (ASRIC, 2025). Research by Idiodi and Urhiewhu (2023) on AI adoption in Nigerian academic library reference, readers' services, cataloguing, and serial control units identified technical knowledge gaps, funding constraints, and lack of government support as the three most significant barriers.

Despite these barriers, some Nigerian universities have begun exploring AI applications. The University of Lagos has reportedly implemented a robotic system for library user assistance, and several universities, including the University of Nigeria, Nsukka; Ahmadu Bello University; and the University of Ibadan, have developed growing digital library platforms and institutional repositories from which AI applications could be



built (Abba, 2024). Emerging AI applications being explored in Nigerian academic libraries include chatbots and virtual reference assistants for real-time user support, automated cataloguing and metadata generation tools using machine learning, personalised recommendation engines for e-resource access, plagiarism detection software, and intelligent search systems powered by NLP (IJSRA, 2025).

2.1.2 Strengths and Positive Outcomes of AI in Academic Library Services

The scholarly literature documents substantial evidence for the positive transformative potential of AI in academic library services across multiple service dimensions.

Enhanced information retrieval stands as one of the most consistently documented benefits. AI-powered discovery systems, using NLP to understand user search intent rather than merely matching keywords, deliver more relevant and contextually appropriate search results than traditional Boolean or keyword-based systems. Semantic search capabilities, powered by transformer-based language models, enable users to retrieve information using natural language queries and receive results that capture conceptual relationships rather than just textual matches (Boateng, 2025; IJRLS, 2025). For researchers navigating the exponentially expanding global literature base, these capabilities represent a qualitative improvement in research support.

Personalised user services represent another significant strength. Recommendation engines that analyse user borrowing and access history, search patterns, and academic profiles can surface relevant resources that users might not have discovered through standard discovery channels. Personalisation capabilities improve the relevance of information provision, reduce information overload, and increase the efficiency with which users can identify materials relevant to their specific research needs (Sousa, 2025; ScienceDirect, 2025). For academic libraries serving large and diverse user communities, personalisation also enables more responsive and user-centred service delivery.

Automated cataloguing and metadata generation offers major efficiency gains in technical services. Machine learning algorithms trained on large cataloguing datasets can assign subject headings, classification codes, and descriptive metadata to new acquisitions with accuracy levels that approach human cataloguing performance while dramatically reducing the time and cost of cataloguing large volumes of materials. This is particularly significant for academic libraries in developing countries where cataloguing backlogs are often large and cataloguing staff are insufficient (OCLC Research, 2025). Automated metadata generation through AI also supports the development of institutional repositories, enabling the systematic organisation and discovery of locally produced research outputs.



2.1.3 Challenges and Weaknesses of AI Adoption in Academic Libraries

The strengths of AI in academic library settings are, however, offset by a set of significant challenges and institutional weaknesses that must be honestly confronted.

Accuracy, reliability, and hallucination risks are critical concerns, particularly for generative AI tools. Large language models are known to generate confident-sounding but factually incorrect responses, a phenomenon termed "hallucination", which poses serious risks in reference and research support services where accuracy is paramount. A 2025 study of fairness and accuracy evaluation of large language models in academic library reference services found systematic variations in response quality across different user demographic groups, confirming that AI reference systems cannot yet be trusted as reliable sources of factual information without human oversight (arXiv, 2025). Libraries deploying AI for reference services must establish robust quality assurance and human review mechanisms to manage hallucination risk.

Algorithmic bias and discriminatory outcomes represent one of the most ethically serious challenges. AI systems trained on existing library catalogues and databases that themselves reflect historical patterns of representation bias privileging resources by authors from dominant demographic groups, in dominant languages, and on topics of interest to dominant scholarly communities risk amplifying rather than correcting those inequities (Noble, 2018; IFLA, 2024; 2025). Reidsma (2019) documented how academic library discovery systems can return systematically biased results for equivalent queries made by users from different demographic backgrounds. The 2025 IFLA manifestos on AI use explicitly acknowledge bias as a primary ethical concern and call on libraries to proactively identify and address bias before deploying AI systems.

Data privacy and user confidentiality risks are inherently created by AI systems that collect and process patron behaviour data to enable personalisation and recommendation features. Academic libraries have a deep professional and ethical commitment to patron privacy and reading confidentiality values expressed in the ALA Code of Ethics, the IFLA Code of Ethics, and Nigeria's Data Protection Act of 2023. AI systems that log user queries, track resource access patterns, and build user profiles for recommendation purposes potentially compromise these privacy values, particularly if the data is stored by commercial AI vendors whose data governance practices may not align with library values (Sousa, 2025; Ethical Challenges, 2025).



2.1.4 Policy Frameworks Governing AI in Academic Libraries

The policy landscape governing AI adoption in academic libraries operates at multiple levels. At the international professional level, IFLA has emerged as the primary voice for library-specific AI governance. IFLA's 2024 and 2025 manifestos on AI use in libraries articulate a framework grounded in core library values such as privacy, intellectual freedom, equity of access, and democratic knowledge governance – and call on libraries to adopt responsible AI practices that include algorithmic bias auditing, transparent user communication about AI deployment, patron privacy protection, and commitment to equitable service delivery. IFLA's framework explicitly identifies privacy, intellectual freedom, and equity of access as the library-specific values that must guide AI governance decisions (IFLA, 2024; 2025).

At the national level in Nigeria, the primary applicable frameworks are the Nigeria Data Protection Act (NDPA) of 2023, which establishes binding obligations for the processing of personal data by all organisations, including academic institutions; NITDA's National Digital Economy Policy and Strategy (2020–2030); and the NITDA AI Strategy Framework, which articulates Nigeria's aspirations for responsible AI development and deployment. The Cybercrimes Act (2015, as amended 2024) provides additional legal context for the security dimensions of AI deployment. However, none of these national instruments provides library-specific guidance on AI governance, and the NUC's library accreditation standards do not yet address AI adoption requirements (ICLG, 2025).

2.2 Theoretical Framework

This study is anchored in two complementary theoretical frameworks that together provide a comprehensive analytical architecture for examining AI adoption in academic libraries.

2.2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model, originally developed by Davis (1989) and subsequently extended by Venkatesh and colleagues, holds that the adoption of new technology by individuals and organisations is primarily determined by two perceptual variables: perceived usefulness (the degree to which a technology is believed to improve performance) and perceived ease of use (the degree to which using the technology is believed to be free of effort). Extensions of the TAM model, including TAM 2, TAM 3, and the Unified Theory of Acceptance and Use of Technology (UTAUT), incorporate additional determinants such as social influence, facilitating conditions, and individual differences.



Applied to AI adoption in academic libraries, the TAM framework explains why librarians who perceive AI tools as genuinely useful for service delivery and relatively accessible to learn and use are more likely to adopt them, while librarians who perceive AI as threatening to professional identity or complex beyond their training are more likely to resist. Shahzad et al. (2025) employed a TAM-informed framework in their systematic literature review of AI adoption factors in libraries, finding that perceived usefulness, technical capacity, institutional support, and training availability were the most influential determinants of adoption intention. This framework directs the study's attention toward the user acceptance dimensions of AI adoption such as the perceptions, attitudes, and organisational conditions that shape librarians' willingness and ability to embrace AI tools.

2.2.2 Responsible AI Theory

Responsible AI Theory, drawing on the work of scholars including Floridi et al. (2018), Jobin et al. (2019), and Mittelstadt et al. (2016), holds that the development and deployment of AI systems must be governed by ethical principles that include fairness (non-discrimination and equitable treatment of all users), transparency (clear communication about how AI systems work and what they decide), accountability (clear assignment of responsibility for AI-generated outcomes), privacy (protection of personal data processed by AI systems), and beneficence (orienting AI deployment toward genuine human benefit). These principles have been incorporated into international AI governance frameworks, including the EU AI Act, UNESCO's Recommendation on the Ethics of AI (2021), and IFLA's AI manifestos (2024, 2025).

Responsible AI Theory is directly applicable to the academic library context because libraries, as institutions whose core mission is the equitable, trustworthy, and value-aligned facilitation of information access, must hold AI deployments to the highest ethical standards. A library that deploys a biased search algorithm or a chatbot that compromises patron privacy is not merely failing to meet a technical standard; it is violating the foundational professional commitments that justify its existence and earn public trust. The Responsible AI framework therefore provides both the normative criteria by which AI deployments in libraries should be evaluated and the governance architecture within which they should be designed and implemented.



3. Methodology

3.1 Research Design

This study employs a qualitative systematic review research design, which involves the structured, transparent, and reproducible review and synthesis of existing peer-reviewed literature, policy documents, and institutional assessments to answer defined research questions. A systematic review design is particularly appropriate for this study because the field of AI in academic libraries is characterised by a rapidly growing body of primary research whose findings need to be synthesised into an integrated analytical account that goes beyond any single study. Black and Champion (1976) and Amin (2025) both affirm that qualitative synthesis is an appropriate and rigorous research approach for studies whose primary goal is the comprehensive, theoretically integrated analysis of a complex institutional phenomenon.

3.2 Data Collection

Data were collected through systematic searching of five databases: Google Scholar, Scopus, Web of Science, Library and Information Science Abstracts (LISA), and ResearchGate using search terms including "artificial intelligence academic libraries", "AI library services developing countries", "AI library adoption Africa", "AI library challenges prospects", "generative AI libraries", "AI library ethics", and "sustainable library information services". Searches were restricted to sources published between January 2020 and June 2025, with priority given to peer-reviewed journal articles, followed by conference papers, institutional reports, and credible professional body publications.

Additional sources were identified through forward and backward citation tracking from key identified articles. Policy documents from IFLA, UNESCO, NITDA, the NDPC, the NUC, and the ALA were obtained directly from institutional websites. A total of 52 sources were identified as meeting inclusion criteria: being peer-reviewed or equivalent; addressing AI adoption, challenges, prospects, or ethics in library settings; published within the specified time window; and substantively addressing the study's research questions. All sources were assessed for methodological quality, institutional credibility, and relevance before incorporation.

3.3 Data Analysis

Data were analysed through thematic synthesis, involving the systematic identification of key themes across collected materials, followed by the organisation of these themes into a



coherent analytical framework aligned with the study's theoretical foundations and research questions. Borgohain et al. (2024), Shahzad et al. (2025), and ScienceDirect (2025) provided the most comprehensive systematic literature reviews that informed the study's literature synthesis. The four theoretical frameworks provided analytical lenses for interpreting empirical findings and for generating normatively grounded policy recommendations. Where studies presented contradictory findings or perspectives, the study endeavoured to represent the range of views and to draw analytically cautious conclusions that acknowledged the limits of available evidence.

4. Major Findings

4.1 Finding 1: Rapid but Uneven Global AI Adoption, with Developing Countries Significantly Behind

Active AI implementations in academic libraries globally grew nearly threefold between early 2023 and early 2025, from approximately 10 per cent to 28 per cent of surveyed institutions, with more than 60 per cent of respondents expressing positive or broadly positive attitudes toward AI (Learn and Work Ecosystem Library, 2025). However, this global average obscures profound geographic disparities. Academic libraries in the United States, United Kingdom, Taiwan, China, and South Africa are deploying sophisticated AI capabilities in routine service workflows, while the vast majority of academic libraries in Nigeria and other developing African countries remain in the awareness and aspiration stage, with limited or no formal AI adoption despite near-universal professional awareness (Moustapha, 2023; ASRIC, 2025; IJSAT, 2025).

4.2 Finding 2: Six Domains of AI Application Offer Transformative Service Potential

AI technologies offer genuinely transformative capabilities across the six major service domains of academic libraries identified in the literature: technical services (automated cataloguing and metadata generation), reference and information services (chatbots and LLM-powered virtual assistants), administrative services and circulation (predictive analytics and workflow automation), collection development (usage-based recommendation and acquisition modelling), information literacy and user education (personalised and adaptive instruction tools), and professional development (competency gap analysis and training recommendation). These applications collectively promise to expand access, improve relevance, increase efficiency, and enhance inclusivity in academic library services, outcomes consistent with the SDG 4 (Quality Education) and SDG 10 (Reduced Inequalities) development objectives.



4.3 Finding 3: Infrastructure, Funding, and Human Capital Deficits Are the Dominant Barriers in Developing Country Libraries

For academic libraries in Nigeria and comparable developing country contexts, the three most consistently documented barriers to AI adoption are inadequate ICT infrastructure (particularly unreliable electricity and insufficient high-bandwidth internet connectivity); acute funding deficits that prevent procurement of commercial AI tools and investment in the human capital development they require; and the absence of AI-literate library professionals capable of governing, deploying, and maintaining AI systems effectively (Barsha and Munshi, 2023; IJSRA, 2025; Idiodi and Urhiewhu, 2023). These structural barriers are mutually reinforcing: without infrastructure, AI tools cannot function; without funding, infrastructure cannot be built; without trained staff, neither infrastructure nor tools can be effectively deployed.

4.4 Finding 4: Ethical Risks, Bias, Privacy, and Transparency Deficits Are Pervasive and Insufficiently Managed

The ethical risk landscape of AI in academic libraries is extensive and substantially unmanaged. Algorithmic bias is documented across multiple AI application areas, including search and discovery, cataloguing, and user recommendation systems, with the potential to amplify existing inequities in information access along lines of language, geography, race, and disciplinary identity (Noble, 2018; IFLA, 2024; 2025; arXiv, 2025). Data privacy risks arise wherever AI systems collect and process patron behaviour data, potentially conflicting with the foundational library commitment to patron confidentiality. Transparency deficits the failure to clearly communicate to users how AI systems work and what decisions they make undermine informed user consent and intellectual freedom. Research by Dale et al. (2024) found that Nigeria provided the bulk of scholarly studies on ethical risks of AI integration in academic libraries, underscoring the particular salience of these concerns in the developing country context.

4.5 Finding 5: The Governance and Policy Framework Is Inadequate at the Institutional Level

Despite improvements at the national level, including Nigeria's NDPA (2023) and NITDA's digital strategy frameworks and meaningful progress at the international professional level through IFLA's AI manifestos, institutional-level AI governance for academic libraries is almost entirely absent. The vast majority of academic libraries, globally and particularly in Africa, are deploying or experimenting with AI tools without



formal AI ethics policies, data protection compliance frameworks, bias auditing protocols, user transparency notices, or incident response procedures (IJSAT, 2025; IJSRA, 2025; Ethical Challenges, 2025). This governance vacuum creates legal exposure under the NDPA, ethical risks for library users, and reputational risks for institutions.

4.6 Finding 6: Generative AI Presents Both the Greatest Immediate Prospects and the Greatest Immediate Risks

The emergence of large language models and generative AI tools since late 2022 has transformed the possibilities for AI in academic library services, enabling near-human quality natural language interaction in reference services, automated summarisation of research literature, intelligent question-and-answer capabilities, and personalised learning experiences. However, generative AI also presents the most serious risks: hallucination (generation of confident but factually incorrect information), deep algorithmic bias embedded in training data, severe data privacy implications from query logging, workforce displacement anxieties among library professionals, and the risk of academic integrity erosion as library users leverage AI for assignment generation (Boateng, 2025; Sousa, 2025; Tandfonline, 2025). Managing the balance between the prospects and risks of generative AI is the most urgent challenge facing academic library leadership today.

5. Discussion of Findings

The findings of this study reveal a complex and paradoxical landscape: AI technologies offer genuinely transformative prospects for academic library services, improving information access, personalising user experiences, automating routine operations, and expanding accessibility while simultaneously presenting an array of challenges that are serious, multidimensional, and, in many cases, systematically under addressed. Understanding this paradox requires integrating the analytical perspectives offered by the study's four theoretical frameworks.

The Technology Acceptance Model helps explain the gap between awareness and adoption that characterises Nigerian and other African academic libraries. Where librarians perceive AI tools as useful in principle but technically complex and institutionally unsupported in practice, adoption intentions remain positive but adoption behaviour remains low. Closing this gap requires not only technical training but also institutional credibility-building measures policy frameworks that give librarians confidence that AI deployment will be governed responsibly; performance monitoring mechanisms that



demonstrate the tools work as intended; and leadership commitment that signals AI adoption as an institutional priority rather than an individual professional experiment.

Responsible AI theory provides the normative foundation for evaluating current AI deployment practices and for designing better ones. The consistent documentation of algorithmic bias, privacy risks, transparency deficits, and governance vacuums in academic library AI adoption represents, from the responsible AI perspective, not simply a technical failure but a values failure, a failure to deploy technology in ways consistent with the foundational commitments to equity, privacy, intellectual freedom, and trustworthiness that define the library as an institution. IFLA's AI manifestos are a beginning, but they need to be operationalised at the institutional level through specific policies, training, and accountability mechanisms that translate abstract ethical principles into concrete governance practice.

The finding that generative AI presents both the greatest prospects and the greatest risks for academic libraries is perhaps the study's most practically consequential analytical conclusion. The speed with which generative AI tools have proliferated from non-existence to near-ubiquity in academic environments within two years of ChatGPT's launch has outpaced the institutional capacity of academic libraries to govern their deployment responsibly. The field faces a governance lag: the tools are ahead of the policies, the capabilities ahead of the skills, the possibilities ahead of the ethical frameworks. Closing this governance lag through urgent action on policy development, staff training, and ethical governance is the most time-sensitive challenge facing academic library leadership in 2025 and beyond.

5.1 Summary

This study has examined the adoption of artificial intelligence technologies in academic libraries, with specific focus on the challenges and prospects for achieving sustainable information services. Drawing on a systematic review of peer-reviewed scholarship, policy documents, and institutional assessments from 2020 to 2025, grounded in four theoretical frameworks such as the Technology Acceptance Model, Diffusion of Innovations Theory, Socio-Technical Systems Theory, and Responsible AI Theory in which the study identified six major findings.

Global AI adoption in academic libraries is growing rapidly but unevenly, with developing country libraries, particularly in Nigeria and sub-Saharan Africa, significantly lagging behind their more resourced counterparts. AI offers transformative potential across six major library service domains. In developing country contexts, infrastructure, funding,



and human capital deficits are the dominant adoption barriers. Ethical risks such as algorithmic bias, data privacy violations, and transparency deficits, are pervasive and insufficiently managed across all library contexts. Institutional AI governance frameworks are almost universally absent, creating legal and ethical risks. And generative AI presents both the greatest immediate prospects and the greatest immediate risks, creating an urgent governance challenge that current institutional capacities are struggling to meet.

These findings were discussed through the integrated lens of the four theoretical frameworks, yielding a composite picture of AI adoption in academic libraries as characterised by social-technical misalignment, diffusion inequity, governance lag, and a fundamental tension between the transformative potential and the ethical risks of AI tools. Eight evidence-based policy recommendations are advanced below.

5.2 Conclusion

Artificial intelligence is not a future possibility for academic libraries; it is a present reality whose pace of penetration into library practice is accelerating globally and whose implications for information access, professional practice, institutional governance, and democratic knowledge production are already being felt. The question is no longer whether academic libraries will adopt AI, but under what conditions, with what governance frameworks, with what investments in human capacity, and with what commitments to ethical, equitable, and sustainable deployment.

This study's central conclusion is that the transformative potential of AI for academic library services such as in information retrieval, personalisation, cataloguing, accessibility, and operational efficiency, is real and significant but will not be realised equitably or sustainably through the current pattern of uneven, under-governed, and under-resourced adoption. A world in which AI-enhanced library services are available only to students at well-resourced institutions in the Global North, while the majority of students in Nigerian and other African universities access information through underfunded libraries without AI capabilities, is a world in which AI deepens rather than diminishes global information inequity.

Reversing this trajectory requires a concerted, multi-stakeholder response: investment in digital infrastructure; integration of AI literacy into library professional education; development of institution-specific AI governance frameworks; enforcement of data protection obligations under national law; international cooperation to make AI tools accessible to under-resourced institutions; and a commitment by library leaders, institutional managers, government bodies, and international professional associations to



ensuring that AI serves the foundational library values of equity, access, and intellectual freedom rather than undermining them. The sustainable future of academic library services depends on getting these conditions right.

5.3 Policy Recommendations

5.3.1 Mandate AI Literacy as a Core Competency in Library and Information Science Education

University departments and schools of Library and Information Science in Nigeria and across Africa must urgently integrate AI literacy as a required component of both undergraduate and postgraduate LIS curricula. AI literacy education should cover the conceptual foundations of machine learning, NLP, and generative AI; practical skills in evaluating, configuring, and using AI library tools; ethical dimensions of AI, including bias recognition, data privacy, and responsible use; and pedagogical skills for teaching AI literacy to library users. The Librarians' Registration Council of Nigeria (LRCN) and the Nigerian Library Association (NLA) should develop mandatory continuing professional development programmes in AI literacy for practising librarians. IFLA should develop internationally recognised AI literacy competency standards for library professionals.

5.3.2 Develop and Implement Institution-Specific AI Governance Frameworks

Every academic library deploying or contemplating AI tools must develop a formal, institution-specific AI governance framework that addresses the scope of AI deployment and its intended service benefits; data privacy protections aligned with Nigeria's NDPA (2023) and IFLA's ethical guidelines; algorithmic bias assessment procedures for all AI systems deployed; transparency notices informing library users about AI deployment and its implications for their data; staff roles and responsibilities in AI governance; incident response procedures for AI errors, biases, and data breaches; and annual review and update mechanisms. The NUC should incorporate AI governance framework requirements into library accreditation standards. NITDA should issue sector-specific AI governance guidance for academic library settings.

5.3.3 Establish a National Academic Library AI Infrastructure Fund

The Federal Government of Nigeria, acting through TETFund and in partnership with state government contributions, should establish a dedicated national fund for AI infrastructure investment in academic libraries. This fund should support high-bandwidth internet



connectivity for university library systems, server infrastructure and cloud computing access for AI deployment, procurement of core AI library management tools on a consortium basis and electricity supply reliability investments (UPS systems, solar backup) for library ICT environments. Applications for this fund should require grantee institutions to demonstrate a compliant AI governance framework and an AI literacy training plan as conditions of eligibility.

5.3.4 Create a Nigerian Academic Library AI Consortium

A collaborative AI Consortium for Nigerian Academic Libraries should be established, modelled on successful consortia such as JISC (UK) and EDUCAUSE (US), to enable member libraries to share AI tool procurement costs, exchange implementation expertise and case study evidence, develop shared training resources for library AI literacy, pool resources for algorithmic bias auditing, and engage collectively with AI tool vendors to negotiate equitable pricing and data governance terms. The NLA, the NUC, and the National Library of Nigeria should jointly provide secretariat and governance support for such a consortium, with seed funding from TETFund and international development partners.

5.3.5 Mandate Algorithmic Bias Auditing for All AI Deployments

In line with IFLA's AI manifestos (2024, 2025) and the Responsible AI principles articulated by Floridi et al. (2018) and Jobin et al. (2019), all AI systems deployed in academic library settings should be subject to regular, independent algorithmic bias audits before deployment and on an annual basis thereafter. These audits should evaluate search and recommendation systems for differential performance across user demographic groups; assess cataloguing systems for representation bias in subject classification and metadata generation; and review chatbot and virtual assistant systems for differential accuracy and fairness across language backgrounds and user profiles. Audit findings should be publicly disclosed and used to inform system improvements.

5.3.6 Develop Transparent AI Use Policies for Library Users

In accordance with the transparency and informed consent requirements of Nigeria's NDPA (2023) and the IFLA Code of Ethics, academic libraries deploying AI tools must develop clear, accessible, and user-facing AI Transparency Notices that explain which library services use AI and how; what data is collected and processed by AI systems; how patron data privacy is protected; how users can opt out of AI-mediated services; and how



users can provide feedback or report concerns about AI performance. These notices should be displayed prominently in physical and digital library environments and should be written in plain language accessible to students and researchers without technical backgrounds.

5.3.7 Integrate AI Adoption Planning into National Education and Digital Economy Policies

The Federal Ministry of Education, NITDA, and the NUC should integrate academic library AI adoption as an explicit component of Nigeria's National Digital Economy Policy and Strategy (2020–2030) and relevant education development frameworks. This integration should include specific targets for AI literacy among library professionals by defined benchmark years; minimum AI infrastructure standards for university libraries incorporated into accreditation requirements; and dedicated funding lines for library AI capacity development in annual federal and state education budgets. NITDA's National AI Strategy should include a dedicated section on AI adoption in academic and public libraries, recognising the library sector's critical role in equitable AI access and digital inclusion.

5.3.8 Foster International and Regional AI Capacity-Sharing Partnerships

Nigerian and other African academic libraries should actively pursue international and regional partnerships that enable AI capacity sharing, technology access, and professional development exchange. Specific partnership opportunities include the UNESCO Memory of the World Programme and its digital access initiatives; the African Library and Information Associations and Institutions (AfLIA) AI working group; bilateral partnerships between Nigerian universities and leading academic libraries in the UK, US, and South Africa for AI tool pilots and staff exchange; and engagement with OCLC Research's global AI readiness initiatives. The knowledge and technology asymmetries between Global North and Global South academic libraries cannot be closed by Nigerian institutions working in isolation; international partnership is essential for accelerating equitable AI adoption.



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