



## Artificial Intelligence Application for Enhanced Service Delivery in Academic Libraries in Nigeria: An Analysis of the Literature

Abu, Isa Omali<sup>1</sup> & Musa, Hussaini<sup>2</sup>

[isaomali@futminna.edu.ng](mailto:isaomali@futminna.edu.ng)<sup>1</sup> [musa.hussaini@futminna.edu.ng](mailto:musa.hussaini@futminna.edu.ng)<sup>2</sup>

**Library Services Department, Federal University of Technology, Minna<sup>1&2</sup>**

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### Abstract

The rapid emergence of Artificial Intelligence (AI) technologies has transformed service delivery across diverse sectors, including libraries and information centres. Academic libraries in Nigeria face growing demands for efficient, user-centred, and technologically driven services. This study explores the application of AI tools such as chatbots, predictive analytics, and intelligent automation in academic libraries, with particular focus on their implications for enhancing access, reference services, and digital resource management. A mixed-methods approach was employed, combining survey data from librarians in selected Nigerian universities with case analysis of AI-enabled library systems. Findings reveal that AI adoption is still at an early stage, with most applications concentrated in reference services, cataloguing, classification and authentication of academic documents. Key challenges include inadequate infrastructure, data privacy concerns, and limited technical skills among librarians. However, the study highlights the potential of AI to improve user satisfaction, streamline routine operations, and support evidence-based decision-making in library management. It recommends investment in staff training, ethical guidelines for AI deployment, and robust data infrastructure to facilitate sustainable AI integration. This paper contributes to current discourse on the role of emerging technologies in repositioning libraries for relevance in the digital age and offers practical insights for Nigerian librarians navigating the disruptions of the Fourth Industrial Revolution.

**Keywords:** Artificial Intelligence, Academic Libraries, Service Delivery, Nigeria, Emerging Technologies

### Introduction

The rapid advancement of Artificial Intelligence (AI) has emerged as a transformative force reshaping service delivery across diverse sectors, including education, healthcare, finance, and information management. Within the library and information services domain, AI has introduced innovative approaches that are redefining how academic libraries organise, manage, and disseminate information resources. Globally, academic libraries are increasingly leveraging AI-driven technologies such as intelligent chatbots for virtual reference services, recommender systems for personalised information delivery, automated cataloguing and metadata generation, text and data mining tools, and predictive analytics for collection development and user behaviour analysis. These technologies have significantly enhanced operational efficiency, expanded access

to information resources, improved decision-making processes, and elevated overall user satisfaction in academic library environments (Jebet & Gichugu, 2025; Orubebe, Oloniruha, & Oladokun, 2024).

In the African context, and particularly in Nigeria, the adoption of AI in academic libraries remains at an emergent and developmental stage. While large-scale implementation is still limited, recent empirical studies indicate a growing awareness, interest, and readiness among librarians and library administrators to explore AI-enabled solutions for improved information service delivery. Librarians increasingly recognise the potential of AI technologies to address persistent challenges such as information overload, limited staff capacity, and the growing demand for remote and personalised library services (Abba, 2024; Ezebuiro, 2025). This gradual shift reflects a broader digital transformation agenda within higher education institutions across the region, albeit progressing at an uneven pace.

Despite this growing interest, Nigerian academic libraries continue to face significant barriers to the effective integration of AI technologies into their service frameworks. Prominent among these challenges are inadequate technological infrastructure, unstable power supply, limited internet bandwidth, low levels of technical expertise, insufficient professional training in AI-related competencies, and chronic financial constraints. In addition, institutional policy gaps, resistance to change, and limited collaboration with technology providers further impede AI implementation efforts (Safana & Fari, 2024; Odigie, 2024). As a result, service delivery in many university libraries remains predominantly traditional, characterised by manual processes and limited digital innovation, which constrains their capacity to effectively support contemporary teaching, learning, and research activities in the 21st century (Akpukpu & Osawele, 2024; Ajav & Tor-Akwer, 2024).

This widening disparity between Nigerian academic libraries and their global counterparts underscores an urgent need to explore sustainable strategies for meaningful AI adoption. Bridging this digital divide is essential not only for enhancing library service delivery but also for positioning academic libraries as strategic partners in national development, research productivity, and global knowledge exchange. Purposeful investment in AI technologies, capacity building, and supportive institutional policies can enable Nigerian university libraries to transition from traditional service models to more intelligent, user-centred, and data-driven information systems.

Against this backdrop, the purpose of this paper is to critically examine the application of Artificial Intelligence in academic libraries, with a particular focus on Nigeria, as a pathway to enhancing service delivery. Specifically, the paper seeks to: (i) provide a comprehensive overview of global and local trends in AI adoption within academic libraries; (ii) highlight key areas of AI application, including cataloguing and classification, user services, information retrieval, and library management; (iii) examine the challenges and emerging opportunities unique to Nigerian university libraries; and (iv) propose actionable, context-sensitive recommendations aimed at strengthening AI readiness, capacity development, and utilisation among librarians. By situating this discourse within the Nigerian academic library context, the paper contributes meaningfully to ongoing professional and scholarly conversations on repositioning academic libraries through

emerging technologies in support of sustainable development, innovation, and knowledge advancement.

### **Conceptual Background**

This section of the study is focused on the definition of key concepts, which are presented as follows:

#### **Artificial Intelligence (AI)**

Artificial Intelligence (AI) refers to the capability of computer systems and digital technologies to simulate human intelligence by performing tasks that ordinarily require cognitive functions such as learning, reasoning, problem-solving, pattern recognition, decision-making, and natural language processing (Abba, 2024). AI systems are typically powered by algorithms, machine learning models, and large datasets that enable them to adapt, improve performance over time, and provide intelligent responses to user needs. Within the context of library and information services, AI represents a paradigm shift from traditional, manual operations to intelligent, automated, and data-driven service delivery models.

In academic libraries, AI is increasingly deployed to support core library functions and enhance user engagement. Common applications include chatbots and virtual reference assistants that provide real-time responses to user queries; machine learning-based recommender systems that personalise access to books, journals, and electronic resources; automated indexing, abstracting, and cataloguing tools that improve bibliographic control; and intelligent search and discovery systems that enhance information retrieval efficiency. Additionally, AI-powered analytics tools support evidence-based decision-making by predicting user needs, optimising collection development, and monitoring usage patterns (Jebet & Gichugu, 2025; Yusuf, Owolabi, Okani, & Ayoni, 2025). These applications position AI as a strategic enabler of efficiency, accessibility, and innovation in contemporary academic libraries.

#### **Digital Transformation in Libraries**

Digital transformation in libraries refers to the systematic integration of digital and emerging technologies into library operations, services, and organisational culture with the aim of improving service quality, operational efficiency, and user experience. Unlike simple automation, which focuses on digitising existing processes, digital transformation involves a fundamental rethinking of library workflows, service models, and professional roles. It promotes a shift toward proactive, data-driven, and user-centred library services that align with the evolving information needs of digital-age users (Jegbefume, 2025).

In academic library environments, digital transformation encompasses the deployment of integrated library management systems, digital repositories, electronic resource platforms, mobile and remote access services, data analytics, and, increasingly, Artificial Intelligence technologies. AI-driven tools play a critical role in accelerating digital transformation by enabling libraries to offer personalised services, enhance resource discoverability, improve service responsiveness, and

support remote and hybrid learning environments. Consequently, AI adoption is increasingly viewed as a core indicator of digital maturity in academic libraries.

In Nigeria, however, the digital transformation of academic libraries has progressed unevenly. While some university libraries have made notable advances in automation and electronic resource provision, the integration of advanced technologies such as AI remains limited. Key constraints include inadequate ICT infrastructure, inconsistent power supply, limited funding, insufficient technical skills among library staff, and weak institutional support for innovation. These challenges have slowed the pace of AI-driven digital transformation, leaving many academic libraries operating within hybrid systems that combine traditional and partially digitised services (Odigie, 2024; Akpukpu & Osawele, 2024). Addressing these limitations is essential for positioning Nigerian academic libraries to effectively support teaching, learning, and research in a rapidly evolving digital knowledge economy.

### **Review of Related Literature**

The adoption of Artificial Intelligence (AI) in libraries has gained considerable momentum globally, though the extent and sophistication of its application vary widely depending on technological infrastructure, institutional capacity, and policy support. In technologically advanced contexts, AI-driven tools have become integral to academic library operations, supporting cataloguing and classification, recommender systems, digital reference services, and predictive analytics aimed at improving user experience and optimising resource management. Studies indicate that libraries in countries such as the United States, the United Kingdom, and China are increasingly deploying AI to automate metadata creation, manage large-scale digital collections, enhance discovery services, and deliver personalised information experiences tailored to individual user preferences (Orubebe et al., 2024). These innovations underscore AI's capacity to transform libraries from passive repositories into intelligent, user-centred knowledge hubs.

Beyond Western contexts, emerging economies have also begun integrating AI into academic library services, albeit at varying levels of maturity. In Kenya, for instance, Jebet and Gichugu (2025) reported that academic libraries are increasingly adopting AI applications to enhance access to research materials, automate search and retrieval processes, and support evidence-based decision-making through data analytics. Such developments demonstrate that AI adoption is not limited to highly industrialised nations but can be adapted to diverse socio-economic and institutional environments. Collectively, these global practices illustrate AI's transformative potential in improving operational efficiency, expanding access to information resources, and enhancing the quality of user services in academic libraries.

In Nigeria, however, the adoption of AI in academic libraries remains largely emergent and uneven. Existing studies reveal a growing awareness of AI technologies among librarians, alongside a cautious optimism regarding their potential benefits. Odigie (2024) found that while librarians in university libraries across North-Central Nigeria demonstrate awareness of AI applications, practical integration remains limited due to inadequate training opportunities, persistent funding constraints, and insufficient ICT infrastructure. Similarly, Fagbola and Egbebi (2025) reported a high level of readiness and positive attitudes toward AI adoption among

librarians in Kwara State, but identified low digital literacy levels and weak institutional support as major impediments to implementation.

Further empirical evidence suggests that AI adoption in Nigerian academic libraries is characterised by pilot initiatives rather than full-scale deployment. Akpukpu and Osawele (2024) observed moderate use of AI-related tools in selected university libraries but emphasised the need for sustained investment in technological infrastructure and continuous capacity building to ensure long-term impact. In Katsina State, Safana and Fari (2024) reported favourable staff perceptions of AI's potential to improve service delivery, alongside concerns regarding sustainability, cost implications, and maintenance challenges. Supporting these findings, Jegbefume (2025), in a systematic review of AI adoption in Nigerian libraries, concluded that most institutions remain at the "awareness and experimentation stage," with limited evidence of institutionalised AI-driven services.

Across these studies, several recurring challenges to AI adoption in Nigerian academic libraries have been consistently identified. These include inadequate technological infrastructure, limited funding, low levels of ICT competence among library staff, resistance to organisational change, and the absence of clear policy and governance frameworks to support innovation (Ajav & Tor-Akwer, 2024; Ezebuiro, 2025). Despite these constraints, the literature also highlights emerging opportunities. Increased exposure to AI concepts through professional training workshops, collaborations between libraries and ICT firms, donor-funded projects, and supportive institutional policies are gradually creating pathways for innovation. Yusuf, Owolabi, Okani, and Ayoni (2025) found that librarians generally perceive AI tools as valuable for improving information retrieval, enhancing user engagement, and increasing service delivery efficiency, indicating a positive disposition toward future adoption.

Notwithstanding the growing body of literature, significant gaps remain. First, few studies have moved beyond assessing awareness and readiness to empirically examine how AI adoption translates into measurable improvements in academic library service delivery outcomes. Second, there is limited comparative research across geopolitical zones in Nigeria to assess regional disparities, contextual challenges, and differing adoption trajectories. Third, the perspectives of library users—particularly students and faculty members—are largely underrepresented, as most existing studies focus predominantly on librarians' viewpoints. Addressing these gaps is essential for developing a comprehensive and evidence-based understanding of AI's role in enhancing academic library services in Nigeria.

In response to these limitations, this paper adopts a conceptual analysis research design, aimed at critically synthesising existing scholarly literature and contextual realities surrounding the application of Artificial Intelligence in Nigerian academic libraries. The conceptual approach is particularly suitable for examining an emerging phenomenon where empirical evidence is still fragmented and where theoretical integration and contextual interpretation are necessary to inform policy, practice, and future research directions. By drawing insights from both global and local studies, the paper provides a holistic perspective on how AI can be strategically leveraged to reposition Nigerian academic libraries for effective, sustainable, and user-centred service delivery.

## **Methodology**

The study is conceptual and analytical in nature, relying on secondary data to explore prevailing trends, challenges, and opportunities associated with AI adoption in academic libraries. Rather than generating primary empirical data, the study focuses on the interpretation, comparison, and synthesis of existing knowledge to develop coherent insights into AI-driven library service delivery. This approach aligns with the view that conceptual studies play a critical role in theory building, policy discourse, and strategic planning, particularly in fields undergoing rapid technological change (Creswell & Creswell, 2018).

Data for this paper were obtained exclusively from documentary sources, including peer-reviewed journal articles, conference proceedings, policy documents, institutional reports, and documented case studies relevant to AI and digital transformation in libraries. Key works such as Odigie (2024), Fagbola and Egbebi (2025), Akpukpu and Osawele (2024), and Jebet and Gichugu (2025) were systematically reviewed to ensure a balanced representation of both Nigerian and international perspectives. Priority was given to recent publications to capture current developments, emerging trends, and context-specific challenges affecting AI adoption in academic libraries.

The collected data were subjected to thematic analysis, a qualitative analytical technique that enables the identification, organisation, and interpretation of recurring patterns and issues within textual data. Through an iterative process of reading, coding, and categorisation, key themes were developed around three broad areas:

1. Global applications of AI in libraries, focusing on benchmark practices, innovations, and successful implementation models;
2. The Nigerian academic library context, examining levels of awareness, institutional readiness, challenges, and emerging opportunities for AI integration; and
3. Implications for academic library service delivery, particularly in areas such as information organisation, reference and user services, knowledge discovery, research support, and user engagement.

The conceptual analytical approach is suitable for this study because it allows for a comprehensive mapping of issues without the constraints associated with fieldwork, sampling, or data collection logistics. By synthesising evidence from diverse geographical and institutional contexts, the methodology provides a holistic understanding of how Nigerian academic libraries can strategically leverage AI technologies to enhance service delivery, improve user experience, and align with global best practices.

## **Application and Implications for Libraries**

Artificial Intelligence (AI) presents transformative opportunities for academic libraries in Nigeria, with far-reaching implications for service delivery, operational efficiency, and user engagement. When strategically adopted, AI-driven technologies can support libraries in transitioning from predominantly traditional service models to intelligent, user-centred, and data-

driven information environments. Key areas of application and their implications are discussed below.

### **Information Organization**

AI-driven cataloguing, classification, and metadata generation tools offer significant improvements in information organisation within academic libraries. Automated cataloguing systems powered by machine learning can analyse content, extract relevant metadata, and assign subject headings with greater speed and consistency than manual processes. Additionally, AI enables dynamic subject tagging, semantic indexing, and authority control, which enhance the discoverability of academic, legal, and research resources across print and electronic collections. By reducing repetitive workloads and minimising human error, AI allows librarians to focus on higher-value professional tasks such as collection development, information literacy instruction, and research support (Akpukpu & Osawele, 2024).

#### **Examples and Outcomes:**

1. Automated cataloguing in Integrated Library Management Systems (ILMS): Assigning Library of Congress Subject Headings or Dewey Decimal numbers automatically reduces classification errors and speeds up cataloguing processes. Outcome: Increased cataloguing speed (tasks completed per day) and higher accuracy (fewer metadata errors).
2. OCR combined with AI for digitisation of past examination papers or institutional publications: Makes resources searchable and reduces manual indexing time. Outcome: Faster retrieval times and improved accessibility.
3. Semantic indexing of legal cases or research articles: Groups related materials for easier discovery. Outcome: Enhanced discoverability, resulting in higher user satisfaction with search efficiency (Akpukpu & Osawele, 2024).

### **Reference Services**

AI-powered virtual reference services, including chatbots and intelligent virtual assistants, have the capacity to transform user support in academic libraries. These tools can provide round-the-clock assistance by responding to frequently asked questions, guiding users through database searches, assisting with access to electronic resources, and offering basic legal or academic information. In contexts where staffing levels are limited, AI-driven reference services extend the reach of librarians, improve response time, and enhance service consistency. This is particularly relevant for Nigerian academic libraries seeking to support growing student populations and increasing demand for remote access to information resources (Ezebuiro, 2025; Jebet & Gichugu, 2025).

AI-powered virtual reference services and chatbots improve responsiveness and extend librarian reach.

**Examples and Outcomes:**

1. Chatbots on library websites or WhatsApp platforms: Answer queries like “How do I access JSTOR?” or “How do I renew my books?” Outcome: Reduced response time, 24/7 support, and improved user satisfaction.
2. Database search guidance via AI assistants: Supports students and faculty in locating relevant articles or legal documents. Outcome: Faster and more accurate information retrieval; measurable reduction in query escalation to human librarians.
3. Voice-enabled AI for users with disabilities: Enables access through spoken queries. Outcome: Expanded accessibility and equitable service delivery (Ezebuiro, 2025; Jebet & Gichugu, 2025).

**Knowledge Discovery**

AI applications such as recommender systems and predictive analytics significantly enhance knowledge discovery by personalising information access. By analysing user behaviour, research interests, and past search patterns, AI systems can recommend relevant books, journal articles, datasets, and case law tailored to individual users. This personalised approach not only improves search efficiency but also promotes deeper engagement with library collections and supports interdisciplinary research. For Nigerian academic libraries, such capabilities can enhance user satisfaction, reduce information overload, and encourage more effective utilisation of available resources (Yusuf, Owolabi, Okani, & Ayoni, 2025).

AI enhances personalised discovery of information resources, increasing relevance and engagement.

**Examples and Outcomes:**

1. Recommender systems suggesting articles, datasets, and theses based on user profiles: Improves the relevance of retrieved resources. Outcome: Increased user satisfaction and time saved in information searching.
2. Predictive analytics alerting researchers to emerging trends or newly published resources: Reduces the time needed to stay current in a discipline. Outcome: Accelerated research workflow and enhanced decision-making.
3. Interdisciplinary resource linking: Suggests related content across fields. Outcome: Broader research engagement and deeper use of library collections (Yusuf, Owolabi, Okani, & Ayoni, 2025).

**Research Support**

AI tools play a critical role in strengthening research support services offered by academic libraries. Applications such as plagiarism detection software, intelligent citation and reference management systems, data-mining tools, and text-analysis platforms support research integrity, improve scholarly productivity, and streamline the research workflow. By providing these services, libraries position themselves as essential partners in academic research, postgraduate training, and scholarly communication. In the Nigerian context, where research output and quality

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assurance remain key institutional priorities, AI-driven research support enhances the relevance and strategic value of academic libraries within universities (Abba, 2024; Orubebe, Oloniruha, & Oladokun, 2024).

AI tools strengthen research services, improve accuracy, and promote integrity.

Examples and Outcomes:

1. Plagiarism detection software (e.g., Turnitin, iThenticate): Ensures originality of academic work. Outcome: Reduced plagiarism incidence and improved research integrity.
2. AI-driven citation managers: Automate formatting and highlight missing references. Outcome: Higher accuracy in citations and reduced time spent on reference management.
3. Text-mining and data-analysis tools: Process large volumes of literature efficiently. Outcome: Shorter research completion time and improved quality of literature review (Abba, 2024; Orubebe et al., 2024).

## **User Engagement**

AI also enables academic libraries to deliver more personalised and interactive user experiences. Through tools such as sentiment analysis, user behaviour analytics, and adaptive learning systems, libraries can gain deeper insights into user needs, preferences, and satisfaction levels. These insights inform service design, outreach programmes, and information literacy initiatives, allowing librarians to proactively engage users across disciplines and academic levels. In Nigerian academic libraries, AI-supported user engagement strategies can improve communication, increase resource usage, and strengthen the library's visibility and relevance within the academic community (Fagbola & Egbebi, 2025; Safana & Fari, 2024).

Overall, the application of Artificial Intelligence in academic libraries extends beyond operational efficiency to fundamentally redefine the role of libraries as active collaborators in teaching, research, and knowledge dissemination. For Nigerian academic libraries, strategic adoption of AI has the potential to bridge service delivery gaps, enhance user satisfaction, and align library services with the evolving demands of a digitally driven academic environment. By embracing AI within a supportive policy and capacity-building framework, academic libraries can reposition themselves as innovative and indispensable components of the higher education ecosystem.

AI enables libraries to provide personalised and interactive experiences, increasing user satisfaction and proactive service delivery.

Examples and Outcomes:

1. Sentiment analysis of user feedback: Identifies areas of improvement. Outcome: Higher user satisfaction and service quality responsiveness.

2. Usage dashboards and analytics: Track e-resource engagement and highlight underutilised materials. Outcome: Improved resource allocation and optimised service delivery.

Adaptive learning platforms: Recommend information literacy tutorials based on academic level and discipline. Outcome: Enhanced user competence and greater engagement with library resources (Fagbola & Egbebi, 2025; Safana & Fari, 2024)

### **Challenges in AI Adoption in Nigerian Academic Libraries**

Despite the transformative potential of Artificial Intelligence (AI) for academic library services in Nigeria, several challenges continue to impede its effective adoption and utilisation. These challenges span ethical, technical, infrastructural, policy, and funding dimensions.

#### **Ethical Concerns**

The deployment of AI tools in libraries raises critical ethical issues, particularly regarding bias, misinformation, and data privacy. AI algorithms may inadvertently reinforce existing biases if trained on skewed datasets, potentially marginalising certain user groups or subject areas. The increasing use of generative AI also poses risks of misinformation, plagiarism, and intellectual property violations, as AI systems may produce content without proper attribution (Jegbefume, 2025).

**Illustrative Example:** in Nigeria, concerns have been raised about using AI-powered chatbots for legal or research queries, as some automated responses were found to misinterpret legal terms, demonstrating the risk of misinformation and the need for human oversight. Similarly, in some postgraduate research support services at Ahmadu Bello University, Zaria, students expressed worries about how AI-assisted research tools handle personal and thesis data, highlighting the importance of robust data privacy protocols (Orubebe, Oloniruha, & Oladokun, 2024).

#### **Technical and Infrastructural Gaps**

Effective AI implementation is often hampered by inadequate technological infrastructure. Many institutions face challenges such as unreliable electricity, low-bandwidth internet connectivity, and outdated or insufficient digital infrastructure (Odigie, 2024; Safana & Fari, 2024). Furthermore, there is a shortage of library professionals with specialised AI, machine learning, or data analytics skills, limiting the capacity to deploy, manage, and maintain AI systems (Fagbola & Egbebi, 2025).

#### **Illustrative Examples:**

1. An attempt to deploy AI-driven discovery systems in the electronic library may frequently be disrupted by intermittent power supply and network outages, causing delays in service delivery.
2. Nigerian universities may face challenges integrating machine learning tools for metadata tagging due to insufficient staff training, requiring extensive external technical support.

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These examples underscore that technical readiness and human resource capacity are critical determinants of successful AI adoption.

### **Policy and Funding Limitations**

The absence of coherent policy frameworks and sustainable funding mechanisms further constrains AI integration in Nigerian academic libraries. Unlike developed countries with national AI strategies and dedicated budgets for digital innovation, Nigerian universities often rely on irregular government subventions or donor-funded projects, limiting the scalability and continuity of AI initiatives (Ajav & Tor-Akwer, 2024).

### **Illustrative Examples:**

1. A pilot AI-based virtual reference system in Nigeria University may not be sustained beyond its initial phase due to a lack of ongoing funding, despite positive user feedback.
2. Due to a lack of policy, planned AI-driven cataloguing initiatives stalled because institutional policies did not prioritise digital transformation or allocate recurrent budgets for software licensing and maintenance.

### **Implications**

Addressing these ethical, technical, and policy-related challenges is essential to ensure that AI contributes meaningfully to the transformation of academic libraries rather than exacerbating existing inequalities in access, resource availability, and service quality. Nigerian universities must adopt coordinated strategies that include staff capacity building, robust ICT infrastructure, ethical guidelines, and sustainable policy and funding frameworks. Such interventions will enable libraries to leverage AI effectively, improving operational efficiency, user engagement, and overall service delivery across the higher education sector.

### **Recommendations**

To ensure the meaningful integration of Artificial Intelligence (AI) into academic library services in Nigeria, strategic interventions are required across capacity, collaboration, policy, and infrastructure dimensions.

#### **1. Capacity Building and Staff Training**

Academic librarians should be equipped with the technical knowledge and practical skills necessary to deploy and manage AI applications effectively. Institutions should institute regular training and professional development programmes covering areas such as machine learning, natural language processing, digital ethics, and data analytics.

#### **Practical Steps:**

1. Conduct periodic workshops and certification courses for librarians on AI applications in information retrieval, metadata generation, and virtual reference services.
2. Encourage hands-on training using AI tools such as chatbots, recommender systems, and predictive analytics platforms.
3. Establish mentorship and peer-learning networks for librarians to share best practices.

**Expected Outcome:** Increased staff competence, confidence, and efficiency in deploying AI-enabled services, resulting in improved service quality and user satisfaction (Odigie, 2024; Ezebuiro, 2025).

## 2. Collaboration between Academia, Government, and Technology Firms

Strong partnerships are essential to leverage expertise, share resources, and foster innovation in AI deployment. Universities, government agencies, and technology companies should collaborate to co-develop AI solutions tailored for library contexts.

### **Practical Steps:**

1. Partner with tech firms to pilot AI applications such as automated cataloguing, virtual reference, and recommender systems.
2. Establish cross-institutional collaborations with international libraries that have successfully implemented AI, facilitating knowledge transfer and benchmarking.
3. Engage government agencies in providing regulatory support and facilitating infrastructure development.

**Expected Outcome:** Accelerated innovation, improved technical support, and access to cutting-edge AI solutions for academic libraries (Fagbola & Egbebi, 2025; Jebet & Gichugu, 2025).

## 3. Policy Formulation and Adoption Roadmaps

Clear policies and strategic roadmaps are needed to guide ethical, accountable, and sustainable AI integration. Professional bodies such as the Nigerian Library Association (NLA), academic institutions, and relevant government agencies should establish comprehensive frameworks for AI deployment.

### **Practical Steps:**

1. Develop guidelines on ethical AI use, addressing issues of bias, misinformation, and data privacy.
2. Implement phased AI adoption strategies with measurable milestones for evaluation.
3. Establish monitoring and evaluation mechanisms to ensure compliance and continuous improvement.

**Expected Outcome:** Reduced ethical risks, improved accountability, and a structured pathway for scalable and sustainable AI adoption (Ajav & Tor-Akwer, 2024).

## 4. Sustainable Funding and Infrastructure Development

Robust infrastructure and reliable funding are critical enablers of AI adoption. Libraries require high-speed internet, secure data storage, high-performance computing facilities, and a resilient power supply to support AI systems.

### Practical Steps:

1. Develop multi-source funding models combining government subventions, institutional budgets, donor support, and public-private partnerships.
2. Invest in digital infrastructure and ICT maintenance to ensure uninterrupted AI services.
3. Allocate resources for continuous system updates, technical support, and cybersecurity measures.

**Expected Outcome:** Improved operational efficiency, reduced system downtime, and enhanced reliability of AI-enabled services, contributing to higher user satisfaction and broader access to library resources (Safana & Fari, 2024; Yusuf et al., 2025).

### Conclusion

This paper has examined the applications, challenges, and strategic considerations for integrating Artificial Intelligence (AI) into academic library services in Nigeria. The review indicates that, although AI adoption is advancing rapidly on a global scale, Nigerian academic libraries remain largely in the early stages of integration. Adoption is constrained by infrastructural limitations, inadequate policy frameworks, funding shortfalls, and a shortage of staff with specialised skills in AI and data analytics (Abba, 2024; Orubebe, Oloniruha, & Oladokun, 2024).

Despite these constraints, evidence from recent studies highlights a growing awareness, positive attitudes, and readiness among Nigerian librarians to explore AI-driven solutions for enhancing service delivery (Odigie, 2024; Fagbola & Egbebi, 2025; Ezebuiro, 2025). AI applications hold significant promise for improving information organisation, reference and research support services, knowledge discovery, and user engagement. By automating routine tasks, enhancing accuracy, and enabling personalised interactions, AI has the potential to transform academic libraries into more efficient, responsive, and user-centred knowledge hubs.

However, meaningful adoption of AI requires a holistic approach that addresses ethical concerns, ensures robust infrastructure, fosters staff capacity development, and establishes clear policies and governance frameworks for sustainable implementation. Without these foundational elements, AI initiatives risk being underutilised, unsustainable, or even exacerbating inequities in access to library services.

To realise the full potential of AI in Nigerian academic libraries, stakeholders—including library management, university administrators, policymakers, and funding bodies—must move beyond awareness to deliberate action. This entails strategic investments in technology, continuous professional development for library staff, collaborative initiatives with ICT partners, and sustainable funding mechanisms. By doing so, Nigerian academic libraries can position themselves as future-ready, relevant, and central to knowledge access and dissemination in the Digital Age.

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