Emerging Trends in Library and Information Services: The Impact of Artificial Intelligence

By

LAWAL, Bilal Muhammad
University Library, Federal University of Technology, Babura,
Jigawa State
Email: bmlawal.library@futb.edu.ng

Abstract

Artificial Intelligence (AI) is increasingly influencing library and information services (LIS) through applications in cataloguing, reference services, discovery systems, research support, and accessibility. However, its adoption in libraries, particularly in developing contexts such as Nigeria, remains uneven and insufficiently guided by ethical and governance frameworks. This study employs a systematic literature review to examine AI applications in LIS, assess their impacts, and identify challenges affecting effective implementation. Relevant literature was sourced from peer-reviewed journals, conference proceedings, policy documents, and institutional reports, and was analyzed thematically. The study's findings demonstrate that AI enhances operational efficiency, personalizes user services, provides inclusive access, and facilitates data-driven decision-making. Nonetheless, persistent challenges, including data privacy risks, algorithmic bias, misinformation, infrastructural constraints, skills gaps, and professional resistance, limit sustainable adoption. The study emphasizes the importance of a human-centered, ethical, and context-sensitive approach to AI integration, aligning technological innovation with core values of librarianship. It concludes that responsible AI adoption can reposition libraries as inclusive and resilient knowledge hubs in the digital age.

Keywords: Artificial Intelligence, Library and Information Services, AI Applications, Digital Libraries, Inclusive Technology

Introduction

Artificial Intelligence (AI) is redefining the boundaries of librarianship in ways that have been both transformative and disputed as libraries shift away from passive information repositories to intelligent, data-driven knowledge ecosystems. Historically, libraries were known to the keepers of printed information; however, digital transformation and intelligent technologies have transformed into interactive, data-driven ecosystems. Despite the fact that Artificial Intelligence offers transformative opportunities for enhancing efficiency, personalization, and accessibility in library and information services, its adoption remains constrained by ethical, infrastructural, and professional challenges. This study seeks to address these issues by examining how AI can be ethically, inclusively, and sustainably integrated into library operations to strengthen service delivery, uphold professional values, and promote equitable access to knowledge.

Components of AI, such as machine learning, natural language processing, and generative models, are revolutionizing cataloguing, discovery systems, reference services, and research support. These technologies are not only automating library operations but also enhancing the librarian's role through predictive analytics, adaptive systems, and personalized services. The study aims to explore how AI can be integrated into core library services, from cataloguing and metadata enrichment to virtual reference assistance and intelligent research assistants. The study will focus on understanding the application of AI and how it can contribute to redefining the traditional boundaries of librarianship.

The growing acceptance by librarians to integrate AI into library operations has prompted a closer look at its impact and the benefits it offers to libraries. AI has significantly impacted libraries, introducing transformative benefits such as personalization, inclusivity, and informed strategic decision-making. Libraries now employ AI tools to predict user needs, recommend systems to enhance discovery, and analytics tools to optimize resource allocation and management. Through AI-powered automation, routine administrative and cataloguing tasks are streamlined, freeing librarians to focus on intellectual and ethical responsibilities. Moreover, AI promotes inclusive access by supporting assistive technologies that cater to users with diverse linguistic and physical abilities. This integration transforms libraries into dynamic, user-centered environments that align with global goals for equity, innovation, and equitable access to knowledge. However, the rapid acceptance and integration of AI into library services raises critical challenges that threaten its long-term sustainability and ethical integrity. The study examines the ethical, infrastructural, and professional barriers that hinder successful implementation.

Ultimately, this study recognizes that while Artificial Intelligence presents vast potential for innovation in library and information services, its successful integration depends on human-centered and context-sensitive implementation. By systematically addressing these three research questions; examining AI's applications, identifying its impact, and evaluating its challenges, the study seeks to provide a comprehensive conceptual foundation for ethical and sustainable AI adoption in libraries. It argues that the future of librarianship lies not in resisting automation but in redefining professional identity around collaboration with intelligent systems. Libraries that strategically adopt AI as a partner rather than a replacement for human expertise can evolve into adaptive, intelligent knowledge hubs that promote creativity, inclusivity, and digital resilience in the 21st century.

Problem Statement

Artificial Intelligence (AI) has the potential to revolutionize library and information services (LIS) by improving efficiency, personalization, accessibility, and research support. However, its adoption is still uneven, mostly conceptual, and inadequately guided by ethical and governance frameworks, especially in developing contexts like Nigeria. Significant obstacles still exist, including data privacy and security risks, algorithmic bias, misinformation, inadequate infrastructure, limited funding, skills deficiencies among library professionals, and resistance stemming from fears of job displacement, even though the literature currently in publication highlights a wide range of AI applications in cataloguing, reference services, discovery systems, and library management.

The predominance of descriptive studies further reveals a gap in integrative, context-sensitive models that align AI innovation with core librarianship values and local institutional realities. If unaddressed, these challenges risk undermining user trust, reinforcing information inequality, weakening professional identity, and widening the digital divide between well-resourced and under-resourced libraries. Consequently, there is a critical need for a human-centered, ethical, and sustainable conceptual approach to AI integration that can guide libraries in leveraging intelligent technologies to strengthen service delivery while preserving professional integrity and equitable access to knowledge.

Research Objectives

1. What are the applications of Artificial Intelligence in library and information services?
2. How does **AI impact** and benefit library operations and services?
3. What challenges are associated with AI adoption in libraries?

Methodology

This study adopted a systematic literature review methodology, a structured and reproducible approach used to identify, select, and synthesize existing scholarly evidence to address clearly defined research questions (Turney, 2023). The methodology ensured transparency and minimized bias by explicitly documenting the procedures for sourcing, selecting, and analyzing relevant literature, making it suitable for a conceptual examination of Artificial Intelligence (AI) in library and information services. Relevant literature was sourced from peer-reviewed journal articles indexed in Scopus, Web of Science, Google Scholar, and ResearchGate, alongside conference proceedings, reports from professional library associations, scholarly books, white papers, policy documents, and government or institutional reports related to AI adoption in library services. Only studies directly addressing AI applications, impacts, and challenges in library and information services were included. The retrieved literature was analyzed using thematic analysis, through which recurring themes, including AI technologies, applications in library services, benefits, and associated challenges, were identified, compared, and synthesized to establish patterns, research gaps, and emerging trends in AI adoption within library and information services.

Literature Review

Applications of Artificial Intelligence in Library and Information Services

Artificial Intelligence (AI) has become increasingly relevant to library and information services because of its ability to automate information-related tasks, interpret natural-language queries, analyse large datasets, and support intelligent interaction with users. One of its major applications is cataloguing and metadata management, where machine learning, natural language processing (NLP), optical character recognition (OCR), and computer vision can support bibliographic description, classification, subject analysis, and metadata extraction. Breeding (2018) observed the increasing incorporation of intelligent technologies

into library service platforms and discovery systems, while Bagchi (2025) proposed generative AI and ontology-based approaches for more dynamic metadata modelling. AI is also applied to reference and access services through chatbots, virtual assistants, and conversational AI, which provide users with immediate assistance in searching library resources and answering routine enquiries (Boateng, 2025; Yang, 2024). According to Tunon (2024), conversational technologies are contributing to the transition from traditional desk-based reference services towards virtual consultation. Similarly, AI-powered information discovery and retrieval systems use machine learning and NLP to interpret search intentions, identify semantic relationships, rank results, and recommend relevant information resources (Enis, 2024). AI is further being applied in research support services, where tools such as Elicit, Consensus, Scite, and Perplexity assist with literature discovery, summarization, citation analysis, and research exploration. Ojala (2023) highlights the emergence of AI-powered research assistants that support researchers in managing and synthesizing large volumes of scholarly information. These applications demonstrate that AI is extending beyond traditional automation to support intellectual and user-centred functions within libraries.

Another important application is user personalization and recommendation services, where AI analyses users' interests, search behaviour, borrowing patterns, and interactions with library platforms to recommend books, articles, databases, and other relevant resources. According to Enis (2024), AI-enabled recommendation systems are increasingly incorporated into library platforms to improve information discovery and user interaction. AI is also being applied to accessibility and inclusive library services through speech recognition, text-to-speech, speech-to-text, computer vision, automated translation, and adaptive interfaces. Miller (2024) highlights the potential of AI-powered assistive technologies to support users with visual and reading difficulties, while AI translation tools can facilitate access to information across different languages. In addition, AI is increasingly used in library management and decision support, where predictive analytics, intelligent dashboards, and machine-learning systems analyse circulation statistics, collection use, staffing patterns, and user behaviour to support acquisitions, budgeting, planning, and service evaluation (Liu, 2024; Wu, 2025). Enis (2024) further reports the incorporation of AI into workflow automation and recommendation systems, demonstrating its relevance to administrative and operational functions. AI is also applied to automation of routine library operations, including circulation, inventory management, data entry, document processing, and other repetitive activities. Robotic Process Automation and machine-learning technologies can reduce manual intervention and streamline workflows (Ogungbenro et al., 2025). These applications indicate that AI is becoming embedded across both technical and managerial dimensions of library operations.

Furthermore, AI contributes to knowledge organization and semantic information management through ontologies, linked data, semantic search, automated classification, and intelligent relationship extraction. Bagchi (2025) demonstrates the potential of ontology-based AI to establish relationships among information resources and improve knowledge representation. AI is also increasingly relevant to information integrity, security, and ethical governance, where intelligent analytical systems can assist in monitoring information environments, analysing user feedback, identifying unusual patterns, and supporting institutional decision-making (Liu, 2024). In Nigerian academic libraries, Ogungbenro et al. (2025) report the relevance of NLP and machine-learning technologies to information extraction and access, although technical and ethical concerns remain. Similarly, Monyela

and Tella (2024) argue that AI-supported knowledge organization can enhance productivity, resource optimization, and inclusive information access when implemented responsibly. Overall, the literature shows that AI applications in library and information services encompass cataloguing and metadata management, reference and access services, information discovery and retrieval, research support, personalization and recommendation, accessibility, management and decision support, routine operational automation, knowledge organization, and information integrity and governance. However, the extent to which these applications are actually implemented varies according to technological infrastructure, financial capacity, staff competencies, institutional readiness, and ethical governance. This variation provides a basis for empirically examining the actual applications of AI in the library environment under investigation.

Impact and Benefits of AI Integration to Library Services

The integration of Artificial Intelligence (AI) has produced significant changes in the efficiency and effectiveness of library operations and information services. One of the most evident impacts is improved operational efficiency, particularly in technical and back-end activities such as cataloguing, metadata creation, classification, indexing, circulation, and routine data processing. Breeding (2018) observed that the incorporation of intelligent technologies into library service platforms supports automation and improves the scalability of library workflows. Similarly, evidence from Nigerian academic libraries indicates that NLP, machine learning, and related technologies can improve metadata extraction and information access (Ogungbenro et al., 2025). AI also contributes to faster and more effective information discovery and retrieval by interpreting natural-language queries, identifying semantic relationships, ranking search results, and generating recommendations. According to Enis (2024), AI-driven discovery and recommendation systems are changing how users interact with library resources. These capabilities can reduce the time users spend searching for information and improve the visibility and accessibility of relevant library collections (Bagchi, 2025). AI therefore has the potential to transform library operations from predominantly manual and reactive processes towards more automated, efficient, and responsive services.

AI has also had considerable impact on reference services, research support, personalization, and user engagement. AI-powered chatbots and virtual assistants can provide immediate responses to routine enquiries, assist users in navigating library resources, and provide support beyond conventional library opening hours. Tunon (2024) notes that conversational AI can enable librarians to concentrate on more complex research consultations and information-literacy activities, while routine enquiries are handled through automated systems. In research support, AI tools can assist with literature discovery, summarization, citation analysis, and identification of relevant scholarly evidence (Ojala, 2023). These capabilities can reduce the time required to undertake literature searches and enable librarians to provide more advanced research-support services. AI also facilitates personalized information services by analysing user interests and behaviour and recommending relevant resources (Enis, 2024). According to Monyela and Tella (2024), intelligent technologies can improve productivity, resource optimization, and user-oriented information provision when appropriately implemented. Furthermore, AI-based speech recognition, text-to-speech, computer vision, and translation technologies can improve accessibility and inclusion, allowing users with different abilities and language needs to interact more effectively with library resources (Miller, 2024; Liu, 2024). Collectively, these

developments can enhance user satisfaction, engagement, convenience, and equitable access to information.

At the managerial and professional levels, AI provides opportunities for data-driven decision-making, improved resource utilization, predictive planning, and transformation of librarians' professional roles. Predictive analytics can analyse circulation patterns, database usage, collection performance, staffing requirements, and user behaviour to support evidence-based decisions concerning acquisitions, budgeting, staffing, and service evaluation. Wu (2025) explains that predictive analytics and decision-support technologies can facilitate data-informed governance and contribute to the emergence of the "hybrid librarian," who combines conventional librarianship with technological and AI-related competencies. AI can also reduce repetitive workloads, allowing librarians to devote greater attention to research support, information literacy, digital services, and other higher-level professional activities (Enis, 2024). However, the impact of AI is not exclusively positive because its benefits can be constrained by inaccurate outputs, algorithmic bias, privacy concerns, inadequate infrastructure, financial limitations, and insufficient professional competencies (Gamage & Tammaro, 2025; Ogungbenro et al., 2025). Therefore, the overall impact and benefits of AI in library operations depend largely on the availability of appropriate infrastructure, staff training, institutional support, ethical governance, and effective human oversight. The literature consequently suggests that AI can significantly enhance library efficiency, service quality, accessibility, research support, user engagement, and managerial decision-making, but these benefits must be evaluated within the specific institutional context in which AI is implemented.

Challenges Associated with AI Adoption in Libraries

The adoption of Artificial Intelligence (AI) in libraries is associated with several technological, ethical, financial, and organizational challenges that can hinder effective implementation. One of the major concerns is data privacy and security, because AI applications often require the collection, processing, and analysis of users' personal information, search histories, borrowing records, and interaction data. Liu (2023) emphasizes that extensive data collection can expose libraries to privacy violations, unauthorized access, and cybersecurity threats. Another major concern is algorithmic bias, which may occur when AI systems are developed using incomplete or biased datasets. According to Miller (2024), biased AI models can produce discriminatory or unrepresentative outcomes, while Liu (2024) stresses the importance of transparency and accountability in AI systems. In library services, such bias may influence search results, recommendations, classification, metadata creation, and the representation of particular subjects, languages, or perspectives (Monyela & Tella, 2024). These concerns demonstrate that the adoption of AI requires strong data-protection practices, continuous evaluation, and professional oversight.

Another important challenge is the accuracy and reliability of AI-generated information, particularly with generative AI systems that may produce fabricated facts, citations, or misleading responses. Boateng (2025) and Yang (2024) emphasize the need for critical evaluation of AI-generated information, especially when AI is used in reference and research-support services. Financial and infrastructural limitations also constrain AI adoption because implementation may require considerable investment in software, hardware, internet connectivity, electricity, data storage, maintenance, and technical support. According to Gamage and Tammaro (2025), inadequate funding and ICT infrastructure can limit digital transformation, while evidence from Nigerian academic libraries indicates that

technical capacity and infrastructure remain important barriers to AI implementation (Ogungbenro et al., 2025). Furthermore, skills gaps and inadequate professional training can prevent librarians from effectively operating, evaluating, and managing AI systems. Tripathi (2024) emphasizes the need for professional competencies, while Wu (2025) advocates continuous professional development to prepare librarians for changing technological environments.

AI adoption may also be affected by resistance to technological change and fear of job displacement, particularly when librarians perceive automation as a threat to their professional responsibilities. Affum and Dwomoh (2025) discuss concerns surrounding the implications of AI for professional roles, while Wu (2025) argues that AI should be viewed as a supportive technology that complements rather than completely replaces librarians' expertise. Another important challenge is the lack of formal ethical and governance frameworks for regulating AI use in libraries. According to Liu (2024), effective AI governance should incorporate transparency, accountability, risk management, and continuous evaluation, while Monyela and Tella (2024) emphasize responsible implementation. Overall, the reviewed literature indicates that privacy and security risks, algorithmic bias, misinformation, financial constraints, inadequate infrastructure, skills shortages, resistance to change, job-displacement concerns, and weak governance frameworks can collectively hinder AI adoption. However, much of the existing literature discusses these challenges conceptually, with limited empirical evidence on their relative severity and combined influence, particularly in federal university libraries in North-West Nigeria. This gap provides justification for the present study to empirically investigate the challenges associated with AI adoption and provide context-specific evidence for effective and sustainable implementation.

Conclusion

It is concluded that Artificial Intelligence has significant applications and benefits across library and information services, including cataloguing, reference services, information retrieval, research support, personalization, accessibility, automation, and management. However, its adoption is constrained by challenges such as privacy and security risks, algorithmic bias, misinformation, inadequate infrastructure, funding limitations, skills gaps, resistance to change, and weak ethical governance. Therefore, effective AI adoption requires adequate infrastructure, continuous staff training, institutional support, ethical policies, and appropriate human oversight to ensure that AI improves library services while maintaining professional standards and user trust.

Recommendations

1. Libraries should strengthen AI infrastructure and institutional support by providing reliable internet connectivity, adequate ICT facilities, appropriate AI tools, and sustainable funding to support effective implementation and maintenance.
2. Library management should provide continuous AI training and professional development for librarians to improve their competencies in AI literacy, information evaluation, data management, ethical AI use, and effective integration of AI into library services.
3. Libraries should develop clear AI policies and ethical governance frameworks covering data privacy, security, algorithmic bias, copyright, misinformation, transparency, and human oversight to ensure responsible, reliable, and sustainable use of AI.

References

Abutayeh, N. (2024). Bringing DeepMind Technology to the Table: Envisioning Library Services using DeepMind Visualization AI. *Public Library Quarterly,* 44(1), 21-31. **https://doi.org/10.1080/01616846.2024.2357396**

Affum, M. Q. (2023). Investigating the Potential Impact of Artificial Intelligence in Librarianship. *Library Philosophy and Practice.*

Affum, M. Q. (2023). The Transformative Impact of Artificial Intelligence on Library Innovation. *Library Philosophy and Practice*. 7999. **https://digitalcommons.unl.edu/libphilprac/7999**

Ali, M. Y. (2023). AI ChatGPT applications in libraries: Challenges and opportunities. Journal of Information & Documentation Studies / Bilgi ve Belge Araştırmaları Dergisi, 20, 18–26. **https://doi.org/10.26650/bba.2023.20.1364582**

Bagchi, M. (2025). Toward Generative AI–Driven Metadata Modelling: A Human–Large Language Model Collaborative Approach. Library Trends, 73(3), 297-322. 10.1353/lib.2025.a961196.

Bates, M. E. (2019). Ay Ay AI. Online Spotlight. **https://onlinesearcher.net**

Bates, M. E. (2019). High-Tech and High Touch. Online Spotlight. **https://onlinesearcher.net**

Boateng, F. (2025). The transformative potential of generative AI in academic library access services: Opportunities and challenges. Information Services & Use, 45(1–2), 140–147. https://doi.org/10.1177/18758789251332800

Breeding, M. (2018). Possible Future Trends. Library Technology Reports. **https://alatechsource.org**

Enis, M. (2024). AI on the Horizon. *Library Journal,* 38-41. **https://www.libraryjournal.com**

Gamage, P., Tammaro, A. M. (2025). The impact of artificial intelligence on Sri Lanka libraries: an interview with Premila Gamage. *Digital Library Perspectives,* 41(1), 179-183. https://doi.org/10.1108/DLP-02-2025-154

Guevara, S. (2024). Report from the Field: Learning about AI and Libraries. Information Today, Inc. **https://infotoday.com/conferences.asp**

Liu, J. (2024). Innovation and risk avoidance of smart library services based on generative artificial intelligence. Journal of Library & Information Science in Agriculture, 53(8), 35–62. https://doi.org/10.1597/j.cnki.issn1006-1641.64-7448

Miguel-Stearns, T., & Laskowski, C., (2025). Artificial Intelligence & the Future of Law Libraries: Bringing together voices and visions to ponder and plan for the future. *AALL Spectrum,* 12-15. http://www.bit.ly/AALLcollectiondev

Miller, T. (2024). Weighing the Merits of AI for Information Access. *Computers in Libraries,* 14-16. **https://infotoday.com**

Ogungbenro, O. D., Esse, U. C., Olowoporoku, I., & Christopher, A. (2025). Revolutionizing Library Services: The Impact of Artificial Intelligence on Cataloguing and Access to

Information in Nigeria Academic Libraries. *Journal of Library Metadata*, *25*(2), 99–118. https://doi.org/10.1080/19386389.2025.2475418

Ojala, M. (2023). AI-Powered Research Assistants. *Online Searcher*, 43-44. https://infotoday.com

Tunon, J. (2024). Redefining reference services in the 21st century. *SLIS Student Research Journal, 14*(2), 11-25. https://research.ebsco.com/linkprocessor/plink?id=0e4ae7de-cc22-39a6-a0be-5554f87abf0b

Yang, S. Q. (2024). ChatGPT: Unleashing the power of conversational AI for library reference services. *International Journal of Librarianship, 9*(1), 109-115. https://doi.org/10.23974/ijol.2024.vol9.1.375