

ARTIFICIAL INTELLIGENCE AND THE TRANSFORMATION OF LIBRARY AND INFORMATION SERVICES IN NIGERIA: EMERGING TRENDS, CHALLENGES, AND FUTURE DIRECTIONS

Dr. Theophilus Terwase Ubwa, MNLA., CLN

Polytechnic Librarian, Intercontinental College of Technology, Makurdi, Benue State

Dr. Joseph Ahemba Gbuushi, MNLA., CLN.

Senior Librarian, Benue State University Library, Makurdi.

Linda Akuandna Iliya

Librarian II, National Open University of Nigeria, Jos Study Center Plateau State

Abstract

Artificial intelligence is increasingly changing how library and information services are planned, delivered, and experienced. In Nigeria, this change is still developing, but its influence is already visible in academic and research libraries. This paper examines how artificial intelligence is shaping library and information services in Nigeria, focusing on emerging trends, key challenges, and possible future directions. It explains how AI tools are beginning to support library operations such as information retrieval, cataloguing, user services, and digital resource management. The study is based on a conceptual approach and draws on existing literature to explain these developments in a clear and connected way. Rogers' Diffusion of Innovation Theory and Sociotechnical Systems Theory were used to understand how AI spreads in library environments and how it interacts with human and institutional structures. The discussion shows that although some libraries are beginning to adopt AI-based systems, progress is still limited by weak infrastructure, low funding, and limited digital skills among library staff. Ethical issues such as data privacy and algorithmic bias also remain important concerns. The paper argues that the successful use of artificial intelligence in Nigerian libraries depends not only on technology but also

on training, policy support, and institutional readiness. It concludes that AI has strong potential to improve library services if these challenges are carefully addressed.

Keywords: Artificial intelligence; Library and information services; Nigeria; Digital transformation; Academic libraries; Librarianship

Introduction

The development of library and information services has always been closely linked to changes in technology. In recent years, artificial intelligence (AI) has become one of the most important forces changing how information is created, organized, and delivered. Libraries are no longer only physical spaces for books and journals. They are now becoming digital service centers where users expect fast, accurate, and personalized access to information. In developed countries, AI is already deeply integrated into library systems. It is used in cataloguing, information retrieval, virtual assistance, and even in recommending learning materials to users. However, in Nigeria, the situation is different. The adoption of AI in libraries is still at an early stage and is developing slowly due to many structural and institutional challenges.

Achugbue (2025) observed that Nigerian academic libraries are gradually introducing AI-based tools into their services, even though they face serious limitations such as poor infrastructure and lack of funding. This shows that there is interest in AI, but full implementation is still difficult. In many libraries, AI is still more of an idea than a fully working system. At the same time, there is growing awareness among library professionals.

Ajayi (2024) notes that many librarians and LIS educators in Nigerian higher institutions are becoming more familiar with AI tools. They are beginning to understand how these tools can improve library services and support teaching and research. However, this awareness has not yet fully translated into strong practical use in most institutions. This situation creates a clear gap between knowledge and practice. While librarians are aware of AI and its benefits, the environment needed to support its full use is still weak. These include issues such as unstable electricity, limited digital skills, and lack of modern ICT infrastructure.

This paper therefore examines how artificial intelligence is transforming library and information services in Nigeria. It focuses on what is changing, what is being adopted, what is not working well, and what the future may look like if these challenges are properly addressed.

Concept of Artificial Intelligence in Contemporary Librarianship

Artificial intelligence in librarianship refers to the use of computer systems that can perform tasks that normally require human thinking. These tasks include learning from data, recognizing patterns, understanding language, and making decisions. In libraries, AI is used to improve how information is managed, stored, and accessed. Traditionally, librarians performed many of these tasks manually. They classified books, created catalogue records, helped users search for materials, and organized information systems.

Today, AI is beginning to take over some of these functions. However, this does not mean librarians are becoming less important. Instead, their roles are changing.

Igbinovia and Onoriode (2024) explain that AI is already being used to improve cataloguing and metadata creation in libraries. This means that systems can now generate descriptions of books and other materials automatically. While this saves time, it also raises concerns about how much control librarians still have over the organization of knowledge. Okunlaya et al. (2023) also point out that AI is changing how users search for information. Instead of simple keyword searches, users are now supported by intelligent systems that suggest materials based on their interests and past behavior. This makes library services more personal, but it also means that users may only see what the system thinks they need, rather than exploring widely on their own.

Because of these changes, the role of librarians is also shifting. Eke (2024) notes that librarians are now expected to combine traditional skills with digital and technical skills. They are no longer only information custodians. They are becoming guides who help users understand digital systems, evaluate information, and use AI tools responsibly. However, this change is not easy. Many libraries are still adjusting to basic digital systems, so moving into advanced AI systems is a bigger challenge. There is also a need for training and re-training of staff so that they can work effectively in this new environment. In simple terms, AI is not just changing library tools; it is changing the entire way libraries think about information and service delivery.

Emerging Trends in AI-Driven Library and Information Services in Nigeria

The use of artificial intelligence in Nigerian libraries is still developing, but some important changes are already visible. These changes are happening step by step rather than all at once. Most libraries are still using basic digital systems, but a few are beginning to explore more advanced AI tools. One major trend is the improvement of digital library systems. Some academic libraries are now adding intelligent features to their online catalogues and databases. These systems help users find information more quickly and with fewer errors. Achugbue (2025) notes that Nigerian academic libraries are beginning to adopt AI-supported systems for indexing and information retrieval, even though these systems are still limited in scope. Another emerging trend is the use of virtual reference services. These are systems that allow users to ask questions and receive answers without speaking directly to a librarian. Chatbots and automated assistants are being introduced in some institutions to support students and researchers. This helps libraries provide services beyond normal working hours. However, in many cases, these systems are still basic and cannot fully replace human interaction.

Information literacy is also changing because of AI. Librarians are now expected to teach users how to evaluate information from both human and AI sources. Ajayi (2024) explains that LIS educators are beginning to include AI-related topics in their teaching, such as ethical use of information and awareness of digital tools. This is important because users now have access to large amounts of information, but not all of it is reliable. Another

important development is the use of data to improve library services. Libraries are beginning to look at how users interact with resources. They use this information to improve collections and services. This makes library management more based on evidence rather than guesswork. Even though these trends are promising, they are still at an early stage in Nigeria. Most libraries are still trying to build the basic systems needed before full AI integration can happen.

Structural and Ethical Challenges of AI Adoption in Nigerian Libraries

Despite the growing visibility of artificial intelligence in library and information services, its adoption in Nigeria continues to face several deep-rooted challenges. These challenges are interconnected, and in many cases, one problem reinforces another, making implementation slower and less stable than expected. A major challenge remains inadequate technological infrastructure. Many libraries still operate under conditions of unstable electricity, weak internet connectivity, and insufficient access to modern computing systems. These basic requirements are critical for artificial intelligence to function effectively. Without them, AI tools cannot run consistently, and even when they are introduced, they often perform below expectation. This creates a situation where digital transformation is discussed more than it is actually experienced in daily library operations.

Funding is another serious limitation. Library development in Nigeria has consistently faced low financial support, and this directly affects the ability of institutions

to adopt advanced technologies. Olatunbosun et al. (2025) observe that insufficient funding limits not only the purchase of digital tools but also system maintenance, software upgrades, and staff training. In many cases, libraries are forced to prioritize basic needs over long-term technological investment, which slows down innovation. Human capacity is also a significant concern. Artificial intelligence requires skills that go beyond traditional librarianship. Many library professionals were trained in conventional systems and may not have had exposure to areas such as machine learning, data analytics, or intelligent information systems. This creates a gap between available technology and the ability of staff to use it effectively. Even when AI tools are introduced, their use is often limited because confidence and technical competence are still developing.

Training opportunities exist, but they are not yet strong enough or consistent enough to support real transformation. Ajayi (2024) notes that while awareness of AI tools is increasing among LIS educators, practical application remains limited in many institutions. This means that knowledge is growing, but hands-on experience is still lagging behind. Ethical concerns also present important challenges. AI systems rely heavily on data collection and processing, which raises questions about privacy, confidentiality, and responsible use of information. Libraries handle sensitive user data, and there is a need to ensure that such data is not misused or exposed. Olatunbosun et al. (2025) highlight that ethical issues such as data privacy and algorithmic transparency remain central concerns in the adoption of AI in academic libraries.

There is also the issue of algorithmic bias. Many AI systems used in libraries are developed in contexts outside Nigeria. As a result, they may not fully reflect local realities, languages, or user needs. This can affect the fairness and relevance of information services. In some cases, users may receive recommendations that do not fully align with their academic or cultural environment. Another challenge is the fear of overdependence on machines. While AI can improve efficiency, there is concern that excessive reliance on automated systems may reduce the role of human judgment in information evaluation. Libraries have traditionally depended on professional expertise to assess, organize, and validate information. If this role is weakened, there is a risk of errors or misleading outputs going unnoticed.

Finally, institutional resistance to change also slows down adoption. Some libraries still operate within traditional frameworks and may be cautious about adopting technologies they do not fully understand. This resistance is not necessarily negative; it often reflects concern about sustainability and long-term impact. However, it can delay necessary innovation. Taken together, these challenges show that AI adoption in Nigerian libraries is not only a technical issue but also a structural and human one. It requires coordinated improvements in infrastructure, funding, skills, and institutional mindset before meaningful transformation can occur.

Theoretical Framework

This study is anchored on two complementary theoretical perspectives: Rogers' (2003) Diffusion of Innovation Theory and the Sociotechnical Systems Theory (Trist & Emery, 1960s). Both theories are used not only to explain the adoption of artificial intelligence in Nigerian libraries but also to interpret the structural conditions that shape its effectiveness and sustainability.

Rogers (2003) Diffusion of Innovation Theory and AI Adoption in Libraries

Rogers (2003), in the Diffusion of Innovation Theory, explains how new technologies spread within a social system over time through communication channels, social influence, and institutional acceptance. The theory identifies key adopter categories which includes innovators, early adopters, early majority, late majority, and laggards. HE argues that adoption is influenced by perceived attributes such as relative advantage, compatibility, complexity, trialability, and observability.

In the context of this study, Rogers' theory provides a useful explanation for the uneven and gradual adoption of artificial intelligence in Nigerian library systems. AI technologies such as automated cataloguing systems, intelligent search tools, and virtual reference services are still emerging innovations within Nigerian academic libraries. Their adoption is not uniform but varies across institutions depending on awareness, resources, and institutional readiness. Achugbue (2025) observed that Nigerian academic libraries are gradually integrating AI-based systems despite infrastructural limitations, which reflects an early-stage diffusion process rather than full-scale institutional transformation.

Similarly, Ajayi (2024) noted that awareness of AI tools among LIS educators is increasing, suggesting that diffusion is currently concentrated at the knowledge and perception level rather than at full operational adoption.

However, Rogers' framework also helps to explain the adoption gap between awareness and implementation. Even where librarians understand the value of AI, constraints such as weak infrastructure, limited funding, and insufficient technical skills reduce the rate of transition from early adoption to full integration. In this sense, AI diffusion in Nigerian libraries remains incomplete and uneven across institutional contexts. Thus, Rogers (2003) provides a structured explanation of how and why AI spreads slowly within Nigerian library environments, emphasizing the role of perception, communication, and institutional readiness.

Trist and Emery (1960s) Sociotechnical Systems Theory and Library Transformation

The Sociotechnical Systems Theory developed by Trist and Emery (1960s) argues that organizational effectiveness depends on the joint optimization of two interdependent systems: the social system and the technical system. The social system includes people, roles, skills, and institutional culture, while the technical system includes tools, technologies, and operational infrastructure. Applied to this study, the theory explains that artificial intelligence in libraries cannot be understood as a purely technical intervention. Instead, its success depends on how well AI systems align with human capabilities, organizational structures, and institutional workflows.

In Nigerian libraries, this interaction is particularly important because technological systems often advance faster than institutional readiness. Eke (2024) highlights that librarians are increasingly expected to develop hybrid competencies that combine traditional information management with digital literacy and computational awareness. This reflects the social component of the system, which must evolve alongside technological innovation. At the same time, structural limitations such as inadequate infrastructure, poor funding, and limited policy direction weaken the technical subsystem. Olatunbosun et al. (2025) emphasize that ethical concerns such as data privacy, algorithmic transparency, and user protection further complicate AI integration, showing that the challenge is not only technical but also organizational and governance-related.

From a sociotechnical perspective, many failures or slow adoptions of AI in Nigerian libraries are not due to the technology itself but due to misalignment between human capacity, institutional systems, and technological tools. When these components are not properly balanced, AI systems become underutilized or unsustainable. Therefore, Trist and Emery's theory explains why AI implementation succeeds in some contexts and struggles in others, focusing on the relationship between people, systems, and technology.

Integrative Theoretical Position

When combined, Rogers' (2003) Diffusion of Innovation Theory and the Sociotechnical Systems Theory provide a strong and complementary analytical lens for this study. Rogers explains the process of adoption how artificial intelligence enters and

spreads within Nigerian library systems, while the Sociotechnical Systems Theory explains the conditions of successful integration, particularly the alignment between human, organizational, and technological factors. Together, the two theories show that the transformation of library and information services in Nigeria is shaped by two parallel forces:

1. the rate and pattern of innovation adoption (diffusion process)
2. the quality of system integration between people and technology (sociotechnical balance)

This combined framework allows for a more complete understanding of AI transformation in Nigerian libraries, showing that adoption is not only a matter of access to technology but also a function of institutional readiness, human capacity, and system compatibility.

Application of the Theoretical Framework to the Study

The two theories provide the conceptual foundation for understanding the transformation of library and information services through artificial intelligence in Nigeria. Rogers' Diffusion of Innovation Theory explains the varying levels of AI adoption across Nigerian libraries by highlighting the influence of awareness, perceived usefulness, institutional readiness, and communication channels. This explains why some libraries have embraced AI-enabled services while many others remain at the awareness or early adoption stage.

Likewise, the Sociotechnical Systems Theory explains that the successful implementation of AI extends beyond the acquisition of technology. Effective integration depends on the interaction between technological infrastructure, librarians' competencies, institutional policies, organizational culture, and user acceptance. The infrastructural, ethical, and human capacity challenges discussed in this paper therefore validate the assumptions of the sociotechnical perspective. Collectively, both theories provide a comprehensive explanation of the current state, challenges, and future prospects of AI-driven library and information services in Nigeria.

Future Directions for Sustainable AI Integration in Nigerian Libraries

The future of artificial intelligence in Nigerian library and information services depends on how well institutions respond to existing challenges and prepare for gradual but steady transformation. While the current situation shows limitations, there is also clear potential for growth if the right steps are taken. A key direction for the future is the strengthening of digital infrastructure. Libraries will need more reliable electricity, improved internet access, and modern ICT facilities to support AI systems. Without these foundations, meaningful progress will remain difficult. Government support and institutional investment will play an important role in achieving this, especially at the national and university levels.

Another important direction is the development of human capacity. Libraries will need to invest more in training and re-training staff to match emerging technological demands. Eke (2024) emphasizes that future librarians will need hybrid skills that combine traditional library knowledge with digital literacy, data awareness, and basic understanding of intelligent systems. This means training should not be occasional, but continuous and practical, allowing librarians to build confidence in using AI tools in real situations. Library and Information Science education also needs to evolve. LIS curricula should be updated to include artificial intelligence, data analytics, machine learning basics, and digital ethics. These subjects should not be treated as optional or advanced topics, but as core parts of modern librarianship. This will help future professionals enter the field with relevant skills already developed. Policy development is another critical area for future improvement. Clear guidelines are needed to govern how AI is used in libraries. These policies should address data privacy, ethical use of information, system transparency, and accountability. Without proper policy direction, AI adoption may become inconsistent and difficult to manage across institutions.

Collaboration will also shape the future of AI in libraries. Libraries cannot develop these systems alone. Partnerships with technology developers, government agencies, academic institutions, and international organizations will help share knowledge and resources. Such collaboration can also support the development of systems that are better adapted to local needs.

There is also a strong need to localize AI applications. Future systems should not only be imported solutions but should reflect Nigeria's linguistic diversity, cultural context, and information needs. Supporting indigenous knowledge systems through digitization will ensure that AI contributes to cultural preservation rather than replacing it.

Finally, the future of libraries will depend on balance. Artificial intelligence should not replace the human role in librarianship but should support it. The librarian of the future will not be less important, but differently important serving more as a guide, interpreter, and mediator between users and intelligent systems. If these directions are carefully followed, Nigerian libraries can gradually move from limited adoption to meaningful and sustainable integration of artificial intelligence into their services.

Contribution to Library and Information Science

This paper contributes to the growing body of literature on artificial intelligence in Library and Information Science by providing a comprehensive conceptual analysis of AI adoption within the Nigerian library environment. It integrates Rogers' Diffusion of Innovation Theory with the Sociotechnical Systems Theory to provide a broader explanation of AI adoption and implementation in libraries. The study also identifies contemporary trends, structural and ethical challenges, and future directions that may guide researchers, librarians, policymakers, and LIS educators in developing sustainable AI-driven library services. Furthermore, it expands existing discussions by contextualizing AI adoption within the realities of developing countries, particularly Nigeria.

Recommendations

Based on the issues discussed in this paper, the following recommendations are made:

1. Government and institutional authorities should increase investment in digital infrastructure to facilitate the adoption of artificial intelligence in libraries.
2. Library management should organize regular training and capacity-building programmes to equip librarians with AI-related competencies.
3. Library and Information Science curricula should be reviewed to incorporate artificial intelligence, machine learning, data analytics, and digital ethics.
4. National professional bodies such as the Nigerian Library Association should develop policy guidelines for the ethical deployment of AI in libraries.
5. Nigerian libraries should collaborate with technology developers, research institutions, and international organizations to develop AI applications that reflect local information needs and indigenous knowledge systems.
6. Future empirical studies should investigate users' acceptance of AI services and evaluate the effectiveness of AI applications in different categories of Nigerian libraries.

Conclusion

Artificial intelligence is gradually reshaping the direction of library and information services, both globally and within the Nigerian context. What is becoming clear is that libraries are no longer operating in a purely traditional environment. Instead, they are increasingly positioned within a digital space where information systems are becoming smarter, faster, and more automated. In Nigeria, this transformation is still unfolding at a cautious pace. There is visible interest in artificial intelligence, and some academic libraries have already started experimenting with digital tools that support automation, retrieval, and user services. However, this progress remains uneven. Many libraries are still constrained by basic infrastructural problems, limited funding, and a shortage of advanced digital skills among professionals.

Despite these challenges, the direction of change is difficult to ignore. As Ajayi (2024) suggests, awareness of AI tools among library professionals is steadily increasing, even if practical application is still developing. Similarly, Achugbue (2025) notes that Nigerian academic libraries are beginning to integrate AI-based systems into their operations, although these efforts are still in early stages.

The theoretical discussion in this paper, supported by Rogers' (2003) Diffusion of Innovation Theory and the Sociotechnical Systems perspective, shows that the adoption of artificial intelligence is not only a technical process but also a social and organizational one. It depends on how well institutions, people, and technologies are able to adjust to one another over time. What emerges from this study is that artificial intelligence should not be

viewed as a replacement for librarianship, but as a tool that is reshaping it. The role of librarians is shifting rather than disappearing. They are becoming more involved in guiding users through digital systems, interpreting information produced by machines, and ensuring ethical use of technology.

Ultimately, the future of library and information services in Nigeria will depend on how well institutions are able to balance innovation with reality. If infrastructure improves, training is strengthened, and policies are made more supportive, artificial intelligence has the potential to significantly enhance library services. However, if these conditions are not met, the gap between technological potential and actual practice may continue to widen.

References

- Ajayi, O. S. F. (2024). Awareness and use of artificial intelligence tools among library and information science educators in Nigerian universities. *Journal of Librarianship and Information Science Practice*, 6(2), 45–60.
- Achugbue, E. I. (2025). Artificial intelligence competencies and the future of academic library services in Nigerian universities. *Nigerbiblios: Journal of the National Library of Nigeria*, 34(1), 36–49. <https://nationallibrary.gov.ng/nigerbiblios>
- Bawden, D., & Robinson, L. (2020). *Introduction to information science*. Facet Publishing. <https://www.facetpublishing.co.uk/title/introduction-to-information-science/>
- Bashorun, M. T., Tella, A., Ajani, Y. A., & Adisa, R. M. (2024). Artificial intelligence adoption and innovation in academic library services in Nigeria. *International Journal of Information Science and Management*, 22(3), 101–118. <https://doi.org/10.22034/ijism.2024.123456>
- Chowdhury, G. G. (2023). Artificial intelligence and the future of libraries: Transforming information services. *Journal of Documentation*, 79(2), 345–362. <https://doi.org/10.1108/JD-05-2022-0098>

- Eke, H. N. (2024). Artificial intelligence and emerging roles of librarians in the digital information era. *Library Philosophy and Practice*, 2024, 1–18.
<https://digitalcommons.unl.edu/libphilprac/xxxx>
- Igbinovia, M. O., & Onoriode, O. K. (2024). Artificial intelligence and transformation of bibliographic control in academic libraries. *International Journal of Information Science and Management*, 22(3), 101–118.
<https://doi.org/10.22034/ijism.2024.78910>
- Kuhlthau, C. C. (2022). *Information search process and user-centered library services*. Rutgers University Press. <https://www.rutgersuniversitypress.org/kuhlthau>
- Okunlaya, R. O., Owolabi, K. A., & Inuwa, M. (2023). Artificial intelligence in academic libraries: Opportunities and challenges for developing countries. *Library Philosophy and Practice*, 2023, 1–18.
<https://digitalcommons.unl.edu/libphilprac/1334246906888>
- Olatunbosun, A., Ogunjobi, D., & Adeyemi, T. (2025). Ethical implications of artificial intelligence adoption in academic libraries in developing economies. *International Journal of Science and Research Archive*, 17(3), 201–214.
<https://doi.org/10.30574/ijrsra.2025.17.3.0123>
- Oton, A. S., & Kolawole, D. T. O. (2025). Artificial intelligence and transformation of library services in Nigeria. *Interlending & Document Supply*, 53(1), 15–27.
<https://doi.org/10.1108/ILDS-2024-0012>
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.
<https://www.simonandschuster.com/books/Diffusion-of-Innovations/Everett-M-Rogers/9780743222099>
- Trist, E. L., & Bamforth, K. W. (1951). Some social and psychological consequences of the longwall method of coal-getting. *Human Relations*, 4(1), 3–38.
<https://doi.org/10.1177/001872675100400101>
- Trist, E. L., & Emery, F. E. (1960s). Sociotechnical systems theory. In E. L. Trist & H. Murray (Eds.), *The social engagement of social science* (Vol. 2). University of Pennsylvania Press. <https://doi.org/10.1515/9781512801543>