

Opportunities and Challenges of Artificial Intelligence for User-Centered Service Delivery in Academic Libraries in Nigeria: A Review

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Abstract

This review paper explores the opportunities and challenges of artificial intelligence for user-centred service delivery in Nigerian academic libraries. The paper highlights that while AI-driven technologies, including chatbots, recommender systems, automated indexing, and predictive analytics, have the potential to improve information access, user engagement, and operational efficiency, the integration of AI in academic libraries in Nigeria is in its nascent stages. Challenges such as limited infrastructure, skill gaps, ethical concerns, and resistance to change are among the factors that hinder AI adoption. The paper concludes that without tools such as chatbots, recommender systems, and intelligent search engines, services remain largely generic, with little personalisation to reflect users' individual needs. This leads to reduced user satisfaction and engagement, especially in a digital era where expectations for seamless and responsive service are high. Furthermore, the absence of AI limits libraries' ability to offer 24/7 support, delays resource discovery, and places a heavier workload on staff, who must manually handle tasks that could be automated. The paper provides recommendations for overcoming these challenges and ensuring effective AI integration in library services, including investment in infrastructure, capacity building and policy development, among others.

Keywords

Artificial Intelligence, User-Centered Services, Academic Libraries, Nigeria, Library Automation

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State Chapter

Introduction

The evolution of digital technologies in the 21st century is both transforming and reshaping society in significant ways. This can be seen not only in how information is produced, but also how it is accessed, managed, and delivered to users (Isiaka et al, 2024). Currently, the most far-reaching digital technology in society is artificial intelligence (AI). In today's digital era, the demand for seamless, efficient, and personalised services has increased. Unfortunately, like other types of libraries in Nigeria, academic libraries are heavily reliant on traditional human-mediated interactions, including face-to-face reference services and manual cataloguing, etc., in carrying out their functions. While this system cannot be completely avoided, some

existing factors today make complete reliance on it no longer tenable.

Firstly, the information needs of users are increasingly complex, and secondly, the exponential growth of digital resources is beyond what can be handled traditionally (Sahabi and Ezeudu, 2020). These factors, among others, demand the integration of AI-driven solutions to complement and enhance human efforts. Vijayakumar and Sheshadri (2019) have observed the multi-functions of AI in academic libraries that can transform library operations. Molaudzi and Ngulube (2025) further note that this can be achieved by the integration of intelligence into the technologies that enhance service quality and facilitate information accessibility for users. In most academic libraries in the developed

countries, AI applications such as natural language processing (NLP), machine learning, chatbots, big data and other concepts related to data science, are revolutionising user interactions with library systems, making information retrieval, content recommendations and research support more efficient (Gasparini and Kautonen, 2022). These advancements in technology allow academic libraries to increase their focus on user-centered service delivery by making user needs, behaviours and preferences a priority in the design and delivery of library services (Akinyemi, 2023).

A user-centred academic library service delivery is one in which the library works together with the users to understand their needs, preferences, and behaviours to be able to customise services and resources to suit them. In other words, the library designs and provides services that are accessible, responsive, and tailored to enhance user satisfaction and engagement (Vagdal and Acharya, 2023). However, while the integration of AI in library services comes with many opportunities, its adoption in academic libraries in developing countries such as Nigeria also introduces challenges that deserve critical examination. This paper focuses on the opportunities and challenges inherent in the integration of AI in user-centred service delivery in academic libraries in Nigeria using a literature review approach.

Definition of Concepts

Artificial Intelligence: Artificial Intelligence (AI) is defined variously by authors and researchers. The Organisation for Economic Co-operation and Development, cited in Olayode (2022), defines an AI system as “a machine-based system that is capable of influencing the environment by making recommendations, predictions or decisions for a given set of objectives.” They further note that artificial intelligence systems use machine and or/human-based inputs/data to

achieve the following: i) perceive real and/or virtual environments; ii) abstract such perceptions into models manually or automatically; and iii) use Model Interpretations to formulate options for outcomes. On the other hand, the European Observatory on Health Systems and Policies (2023) views AI as “systems that display intelligent behaviour by analysing their environment and taking action – with some degree of autonomy – to achieve specific goals.” Similarly, Robinson (2018) says artificial intelligence (AI) is “the ability of a digital computer, computer-controlled machine or robot to perform tasks commonly associated with intelligent beings like humans.” Yet another definition perceives AI as “the technology that enables machines to have the abilities to plan, learn, reason, solve problems, move, and to some extent be creative (Heath, 2018). The definitions above convey that AI is fundamentally about machines exhibiting intelligent behaviour by analysing data, learning patterns, making decisions, and interacting with their environment to achieve set objectives, often with some level of autonomy. It also suggests that AI is capable of performing whatever tasks it is properly engaged to do, and can be applied in all sectors of society. This is incredible because some years back, these AI qualities and capabilities were only associated with human beings. No wonder Boucher (2020) asserts that “artificial intelligence (AI) is probably the defining technology of the last decade, and perhaps also the next.” AI presents some opportunities for user-centred library service delivery in academic libraries.

User-Centred Library Service: The mission of academic libraries is to serve members of the educational institution where they are located with relevant resources in varying formats for learning, teaching, and research, and other services that support their objectives. Beyond the provision of information resources and services, however,

it is important that library users have access to what the library has for them, and that their needs are met. To that extent, academic libraries are tasked to continuously explore means and opportunities to align their services to satisfy their users' needs (Nasir and Tyagi, 2023). This is why today the emphasis and focus of academic libraries is on access creation, not only to the resources a library has, but also the ones that are owned by other libraries and information services. As a result, ownership of information resources is being de-emphasised while much emphasis is laid on access. This entails that any academic library that is worth its salt will continue to evolve and adapt in line with changing times (Whitehair, 2016).

To that extent, an academic library fails in its duties if the resources and services it provides are not beneficial to the users. This is the thrust of user-centred library services. Kautonen and Nieminen (2018) conceive a user-centred library as one that is focused on providing the best possible experience for its users by constantly evolving and adapting to meet their changing needs and preferences (Kautonen & Nieminen, 2018). A user-centred service may also entail the offer of various programmes and services to meet the needs of different user groups (Sadeh, cited in 2007). In addition to physical resources and services, a user-centric library may also offer online resources and services, such as e-books, online databases, and virtual reference services. These resources are designed to be accessible and easy to use, with intuitive interfaces and user-friendly search tools.

It is worth noting, however, that user-centred library service is not a new concept in academic libraries, as before now, academic libraries have used tools such as surveys, focus groups, and other methods of user research to gain insights into what the users need and want from the library. However, the emergence of digital technologies, and particularly artificial intelligence, and its incorporation into library services offer

incredible opportunities for taking user-centred service to a whole new level. Without doubt, AI technologies offer innovative ways to enhance library services, improving accessibility, efficiency, and user engagement, given that AI can personalise experiences, anticipate user needs, and automate repetitive tasks far beyond what any traditional or manual system can do, leaving librarians more time to offer the in-depth expertise that is essential for advanced research (Pence, 2022).

Opportunities of AI for User-Centered Library Services in Academic Libraries

Artificial Intelligence (AI) has emerged as a powerful and transforming force in academic libraries, enhancing user-centered service delivery through automation, personalisation, and improved information access. AI applications in academic libraries are designed to improve the user experience by making information retrieval more intuitive, library interactions more seamless, and services more efficient (Pence, 2018). In recognition of the enormous roles AI can play in user-centred library services, Tella (2020) posits that academic libraries should leverage library services with AI to improve their services to their users. According to Rayne (2024), AI offers numerous advantages for enhancing user-centred library services in the following ways: 1. Improved access to information, 2. enhanced user engagement, 3. operational efficiency, and 4. data-driven decision-making.

1. Improved Access to Information:

Access to information is one of the cardinal responsibilities of academic libraries. This is because information contained in library resources can at best be described as "potential energy" until they are accessed and used. Information resources in varying formats contain information that, when used, can produce results in support of the objective of the user. It was in a bid to improve access to

information that traditional tools such as the card catalogue, among other access tools, were developed by libraries. These access tools have played significant roles in enabling users to access the contents of libraries. But the traditional tools are inadequate in the face of the large volumes of information available in print and electronic formats. The Internet came as a big boost for accessing electronic information. But in the digital age, artificial intelligence has emerged as a bigger boost for access to information. AI-powered search tools provide more accurate and faster retrieval of resources. Rayne (2024) outlined how AI improves access to information for the disabled as follows:

- AI enhances web accessibility through smart, adaptive technologies
- Automatic captions and voice control improve digital inclusivity
- AI-powered image recognition aids visually impaired users
- Machine learning personalises online experiences for diverse needs
- AI tools break language barriers with real-time translation
- Assistive technologies are becoming more sophisticated with AI integration

A close examination of the above shows that the services are user-centred services that academic libraries can adopt for accessibility to information by different kinds of library users.

2. **Enhanced User Engagement:** AI personalised recommendations and interactive AI assistants improve user satisfaction. Jyoti and Kumar (2024) note that “artificial intelligence search

engine algorithms improve the way that information is found in databases and library catalogs.” As a result of the ability to understand and handle user queries, Natural Language Processing (NLP) approaches increase search accuracy. Again, chatbots and virtual assistants are becoming an increasingly common technology integration employed for service delivery in academic libraries to enhance user engagement and ensure user satisfaction and operational efficiency. For instance, Zondi et al., cited in Molaudzi and Ngulube (2025), report the successful integration of AI into library operations by the Durban University of Technology. Some of these integrations include the use of predictive analytics for resource management, automated cataloguing systems and AI-driven chatbots that assist with user enquiries. Romero (2018) also agrees about the capacity of AI to enhance library users’ effort in finding and retrieving new media more efficiently and effectively, and also introduce non-traditional materials.

3. **Operational Efficiency:** AI-driven technologies now enhance virtual reference services, improving the library's ability to assist patrons effectively and remotely. The University of Pretoria has implemented AI technology to improve the efficiency of several library services (University of Pretoria Department of Library Services, 2024; Zondi et al., 2024). This includes using AI-powered recommendation systems to customise user experiences and machine learning techniques to manage digital collections. These innovations have enhanced access to information and resulted in more effective use of resources.

4. **Data-Driven Decision-Making:** AI analytics help libraries understand user behaviour and optimise resource allocation. This is possible because AI tools can help with the analysis of “library usage data to spot patterns, such as most popular resources, the subjects that are most in demand, or the times when usage is at its highest and decisions about resource allocation and collection development can be influenced by such information” (Isiaka, 2023). This information, if properly used, will ensure that libraries are making evidence-based decisions for the benefit of their users. This is particularly important given the poor funding situations of most academic libraries in Nigeria, as it will ensure proper deployment of meagre resources in collection development.

Status of AI Integration in User-Centred Services in Academic Libraries in Nigeria

While researchers have continued to investigate the application/integration of AI in academic library services in Nigeria, such studies have been mostly theoretical and have often focused on awareness and potential rather than case studies of effective AI implementation. For instance, Aminu (2024) revealed that although librarians in regions like Katsina and Kwara States are aware of AI applications such as chatbots and natural language processing, the extent of their actual implementation in daily library operations is limited. To that extent, it is not out of place to assert that AI integration in Nigerian academic libraries remains in its nascent stages. In support of this assertion, a survey involving 174 university librarians revealed that only 25 institutions had initiated AI-related activities; however, these were often without a structured strategy (Adeleke, Godwin and Othman, 2024). However, regional variations have been found in the extent of usage of AI in libraries. A study by

Aminu (2024) in the North-Western states of Nigeria revealed that academic libraries in the region use AI tools such as Online Public Access Catalogues (OPAC), search engines, and social media platforms in their operations. However, more advanced technologies, including robotics and Radio-Frequency Identification (RFID) systems, are yet to be adopted. Additionally, Omeluzor and Ojukwu (2024) surveyed librarians on the potential of AI in collection development in university libraries and found that librarians agree that AI technology has the potential for effective prediction, automation, analysis, elimination of repetitive tasks, forecasting, budgeting and reviewing of collection development at the university library. Odigie's (2024) study among fifty-two reference librarians in university libraries in the north-central geopolitical zone of Nigeria also revealed that while the librarians showed a substantial awareness of AI tools, including ChatGPT and Gemini, those tools were used primarily for personal use rather than professional service delivery within libraries. While agreeing that AI implementation in academic libraries in Nigeria is in its nascent stage, Aminu (2024) further noted that its use is constrained by several factors, including paucity of funds, lack of requisite skills and poor infrastructure, especially epileptic power supply and poor internet access.

Challenges of AI Adoption in Nigerian Academic Libraries

Undoubtedly, AI has the potential to significantly impact user-centred services in academic libraries through several ways, including search and resource discovery, ultimately allowing for faster searches and improved indexing. Also, its recommender systems with the ability for personalisation of user needs are some of the opportunities that AI presents. All these can improve existing systems and activities, and so improve user experiences (Mallikarjuna, 2024). Despite its potential, however, AI adoption in Nigerian

academic libraries faces several obstacles, including the following

1. **Limited Infrastructure:** Many libraries lack the necessary computing power and internet connectivity (Aminu, 2024). Inadequate technological infrastructure, including unreliable power supply and limited internet connectivity, poses an enormous obstacle to the adoption of AI in libraries (Echedom & Okuonghae, 2021).
2. **Skill Gaps:** A significant number of librarians lack the necessary training to effectively implement and manage AI tools, leading to underutilization of available technologies. A shortage of AI-literate librarians affects implementation. This is because AI implementation in libraries requires expertise in AI technologies, data analysis, and programming (Mali. and Deshmukh (2021). In support, Yoon et al. (2022) further observed that before public academic libraries can fully adopt AI, the librarians must have the requisite skills for using digital facilities as well as a solid understanding of AI operations. As it stands, Joel (2025) observes the inadequacy of technical expertise among some professional librarians in Nigeria, including the inability to communicate responsibly with appropriate technology, problem-solving, and access, manage, integrate, evaluate training, and create information to improve learning. In essence, without the recruitment of librarians with the requisite technical skills and the training of librarians in employment, the ideal of AI implementation in academic libraries in Nigeria may remain a mere pipe dream (Echedom and Okunoghae, 2020).
3. **Ethical Concerns:** AI raises serious ethical concerns, such as data privacy and algorithmic bias, which must be addressed. In the same light, Mane (2024) and Barsha and Munshi (2023) posit that while artificial intelligence offers many opportunities to libraries, its integration also brings up important ethical issues, such as algorithmic biases and user data privacy issues. Mali and Deshmukh (2021) note that “biases embedded in the algorithms and potential discrimination” is a challenge to libraries.
4. **Data Quality and Availability:** This is another area of challenge in implementing AI in user-centred services in academic libraries in Nigeria. Joel (2025) views this from the perspective that “AI algorithms heavily rely on high-quality and relevant data to produce accurate results... there “may be challenges in obtaining and curating datasets that are comprehensive, up-to-date, and representative of their user base.” In addition, “ensuring the availability and accessibility of data can be a challenge due to privacy concerns and restrictions on data sharing” (Joel, 2025).
5. **Resistance to Change:** Librarians and users may be hesitant to embrace AI-driven services. Adoption and integration of AI in library operations may be hindered by a resistance to change among staff, as factors such as fear of job displacement, unfamiliarity with the technology or concerns about the reliability of AI systems can be a deterrent. This is particularly so with older staff who have become accustomed to using the traditional systems and tools in their work (Adebayo and Aina cited in Akpukpu and Ekeikhomen, 2024).

6. **High Cost of AI Implementation:**

Financial constraint is a huge impediment to AI adoption by underfunded institutions given the high cost associated with acquiring and maintaining AI systems. Unfortunately, this is the reality of many public universities in developing countries, including Nigeria (Echedom & Okuonghae 2021).

Conclusion

This review has demonstrated that AI has the potential to transform and revolutionise user-centered service delivery in Nigerian academic libraries by improving efficiency, accessibility, and personalisation. Unfortunately, its adoption by academic libraries in Nigeria is in its nascent stages as a result of some challenges. This has implications for practice.

Without tools such as chatbots, recommender systems, and intelligent search engines, services remain largely generic, with little personalisation to reflect users' individual needs. This leads to reduced user satisfaction and engagement, especially in a digital era where expectations for seamless and responsive service are high. Furthermore, the absence of AI limits libraries' ability to offer 24/7 support, delays resource discovery, and places a heavier workload on staff, who must manually handle tasks that could be automated. These challenges are more pronounced in underfunded institutions, as they continue to deepen existing disparities in access to quality library services. In addition, the lack of data-driven insights hinders the ability of libraries to make informed improvements based on user behaviour. Resolving these challenges will imply pursuing measures that will better position academic libraries to integrate AI into user-centred service delivery. This will ensure that they remain relevant and responsive in a rapidly evolving digital information landscape.

The Way Forward

i. **Investment in Infrastructure:**

Presently, the state of infrastructure in universities, and by inference, the university libraries, leaves much to be desired. For AI to thrive, there must be sustainable infrastructure, including electricity and reliable internet connectivity.

Therefore, strengthening digital infrastructure to support AI technologies is an imperative for both universities and libraries. Given this, the federal and state governments, university administrators, and library management must move in this direction. This can be achieved through budgetary support targeted to digital infrastructure, prioritisation of electricity, and reliable internet connectivity in higher education institutions. Opportunities such as public-private partnerships with tech companies can be explored for the provision of hardware and software support at reduced costs.

ii. **Capacity Building:** The critical role of staff in the implementation and sustainability of AI in our higher institutions cannot be overemphasised. This is imperative because the availability of AI tools is not enough to guarantee utilisation if staff remain untrained. It is the responsibility of library management to ensure that competent staff are employed and that opportunities for training and retraining of serving staff are prioritised. Additionally, the Nigerian Library Association and university administrators should organise regular training programmes, workshops, and short courses in AI tools, data analysis, and programming to equip librarians with the skills needed to leverage AI technologies effectively. Library

administrators should also partner with ICT departments within universities to integrate AI skills into continuous professional development for librarians. Furthermore, all stakeholders should prioritise the integration of AI literacy modules into LIS curricula in universities to equip future librarians with skills consistent with international best practices.

iii. **Policy Development:** Given the issues surrounding AI, clear policies and frameworks to guide the ethical and strategic integration of AI in library services in Nigeria should be established. The National Universities Commission (NUC), the Ministry of Education, university governing councils, and library leadership are to form policy committees involving librarians, ICT experts, and policymakers to draft ethical guidelines on AI use in libraries. The committees should develop frameworks addressing data privacy, intellectual property, and algorithmic fairness. Furthermore, libraries should be encouraged to adopt institutional AI policies aligned with national ICT strategies.

iv. **Collaboration:** Universities and, particularly, academic libraries cannot afford to continue working in silos in this era. They should leverage partnerships with tech companies and institutions, global and regional technology companies, NGOs, and international agencies to pilot AI projects in Nigerian libraries. Additionally, academic libraries should form partnerships with educational institutions and technology providers that can facilitate resource sharing and innovation in AI applications. The establishment of consortia to pool resources for AI adoption, share best

practices, and negotiate collective licensing agreements is imperative, given the poor funding situation of academic libraries in Nigeria.

v. **Funding:** Academic libraries must explore every means possible to supplement their meagre allocations, including seeking grants and institutional support from both internal and external sources for AI projects in libraries. Library management, in collaboration with university administrators, should diversify its funding sources by approaching NGOs, private foundations, and development partners, and also explore income-generating services such as consultancy and training programmes to support AI projects. In other words, the times require thinking outside the box for innovative and creative avenues for fund generation.

vi. **Advocacy:** Advocacy is about influencing people and policies to make funding and policy implementation possible. For libraries, advocacy for AI would mean librarians, associations, and stakeholders campaigning, creating awareness, and engaging decision-makers (government officials, university administrators, or funding agencies) to support and prioritise AI adoption in academic libraries. Library associations, library leadership, and academic stakeholders should develop awareness campaigns showcasing the benefits of AI in enhancing library services. They should publish policy briefs and engage in dialogue with education policymakers to prioritise AI integration in national higher education strategies. The use of success stories from pilot projects will go a long way to not only influence stakeholders but also secure wider support for AI integration in libraries.

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