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THE IMPACT OF ARTIFICIAL INTELLIGENCE ON LIBRARY SERVICES IN NIGERIA: OPPORTUNITIES AND CHALLENGES: AN OVERVIEW

[1] Haruna, Abubakar Sadiq (CLN, MNIMC), [2]Kabiru Ibrahim (CLN), [3]Anna Michael

[1&3]Audu Wuyah Ambi Library, Kaduna state college of Education, Gidan waya: PMB1024, Kafanchan, harunaasadiq@gmail.com +234 8069217275.
[2]Federal University Library Wukari, PMB 1020 Wukari, Taraba State, kabiruibrahim@fuwukari.edu.ng. +2348063257647. [3]Audu Wuyah Ambi Library, Kaduna state college of Education; Gidan waya. Kaduna state, annamichaelu12ls2010@gmail.com, 08059174604

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ABSTRACT

The integration of Artificial Intelligence (AI) into library services has significantly transformed information management, accessibility, and the overall user experience worldwide. In Nigeria, the adoption of AI technologies in libraries is slowly gaining momentum, offering transformative possibilities such as improved cataloging, personalized user services, and more efficient resource management. However, several challenges including inadequate infrastructure, limited technical expertise, funding constraints, and ethical concerns are preventing the full potential of AI from being realized in Nigerian libraries. This study examines the current impact of AI on library services in Nigeria, highlighting key advancements, benefits, and obstacles. Using a mixed-methods approach that includes surveys and interviews with library professionals, the research identifies strategies to overcome these challenges, such as capacity building, infrastructure development, and stakeholder collaboration. The findings emphasize the need for a strategic and inclusive approach to AI adoption, stressing the importance of government, academic institutions, and private sector partnerships in fostering sustainable digital transformation. By addressing these challenges and harnessing the potential of AI, Nigerian libraries can improve service delivery, enhance operational efficiency, and contribute to the nation's socio-economic development.

Keywords: Keywords: Artificial Intelligence, Library Services, Nigeria, Digital Transformation, Information Management, and Infrastructure.

INTRODUCTION

Artificial Intelligence (AI) is revolutionizing various sectors globally, and library services are no exception. In Nigeria, libraries are gradually integrating AI technologies to enhance service delivery, improve user experience, and streamline operations. This transformation presents both opportunities and challenges that must be carefully examined to maximize the benefits of AI in library services.

AI technologies such as chat-bots, machine learning algorithms, and predictive analytics are being employed to automate routine tasks, such as cataloging and classification, thereby freeing up librarians to focus on more complex and value-added activities (Okoro & Ogbodo, 2021). For instance, AI-powered virtual assistants can provide users with 24/7 access to information, answer frequently asked questions, and recommend resources based on user preferences (Eze & Chukwuemeka, 2020). These innovations have the potential to make library services more accessible and efficient, particularly in a country like Nigeria, where many libraries face challenges such as inadequate funding and limited staff.

However, the adoption of AI in Nigerian libraries is not without its challenges. One major issue is the lack of technical infrastructure and expertise needed to implement and maintain AI systems effectively (Adebayo & Olaniyi, 2019). Additionally, there are concerns about data privacy and the ethical implications of using AI in information management. For example, the use of AI to track user behavior raises questions about consent and data security (Oluwaseun et al., 2022).

Despite these challenges, the opportunities presented by AI in enhancing library services in Nigeria cannot be overlooked. By leveraging AI technologies, libraries can improve resource management, provide personalized services, and bridge the digital divide for underserved communities. To achieve this, it is essential for stakeholders' government agencies, library associations, and technology providers to collaborate on developing policies and training programs that support the sustainable integration of AI into library systems.

The impact of AI on library services in Nigeria is a double-edged sword, offering significant opportunities while also posing notable challenges. Addressing these challenges through strategic planning and investment will be crucial in ensuring that Nigerian libraries can harness the full potential of AI to serve their communities effectively. Obande, et al (2024) started that Artificial Intelligence (AI) research tools have become increasingly important for enhancing academic productivity in universities. These tools encompass a wide range of technologies, including machine learning algorithms, natural language processing, and data analytics, which can be utilized to streamline research processes, analyze complex data sets, and generate valuable insights. With the growing availability of AI research tools, it is essential for academic institutions to raise awareness and promote their utilization among faculty and students.

Objectives of the Study

The primary objectives of this study are to:

1. Assess how AI enhances access to information and resources
2. Explore the role of AI in improving efficiency and automation in library operations
3. Identify AI-driven tools for personalized user experiences

Other objectives are:

- **Evaluate the Impact of Artificial Intelligence (AI) on Library Services**

  To investigate how AI technologies are transforming traditional library operations, including cataloging, information retrieval, user services, and resource management in Nigerian libraries.

- **Explore the Opportunities Provided by AI**
  To identify the various opportunities that AI offers libraries in Nigeria, such as enhanced service delivery, improved access to information, and automation of administrative tasks.

- **Assess the Challenges Faced by Nigerian Libraries in Adopting AI**
  To examine the major challenges Nigerian libraries encounter in integrating AI technologies, such as lack of infrastructure, insufficient funding, staff resistance, and limited technical expertise.

- **Understand the Implications for Library Management and Policy**
  To explore how AI affects library management practices, including the implications for policy development, training, and strategic planning within Nigerian libraries.

- **Propose Recommendations for Effective AI Integration**
  To provide practical recommendations on how Nigerian libraries can optimize the benefits of AI while overcoming existing barriers to adoption.

Statement of the Problem

The integration of Artificial Intelligence (AI) into library services in Nigeria presents both significant opportunities and notable challenges. On the one hand, AI has the potential to revolutionize the way libraries operate by enhancing cataloging systems, enabling personalized user experiences, and improving access to digital resources. For instance, AI-driven tools can assist in automating routine tasks such as indexing and classification, thereby allowing librarians to focus on more specialized services (Smith, 2020). Additionally, AI-powered chat-bots can provide real-time assistance to users, making libraries more accessible and user-friendly (Johnson & Adeyemi, 2021).However, the adoption of AI in Nigerian libraries is not without its challenges. Limited funding, inadequate infrastructure, and a lack of technical expertise are significant barriers to implementation (Okeke, 2019). Furthermore, AI is concerns about data privacy and ethical considerations. The digital divide in Nigeria also exacerbates inequalities, as rural or underserved communities may find it difficult to benefit from these advancements (Eze & Olatunji, 2020). While AI offers transformative possibilities for library services in Nigeria, addressing these challenges is crucial to ensure equitable and sustainable adoption.

Theoretical Framework

The theoretical framework for this study is grounded in several theories that examine the integration of new technologies within organizational contexts and their effects on service delivery.

The study uses Social Construction of Technology (SCOT) Theory and this was propounded by Pinch and Bijker (1984), SCOT who emphasizes that technological development is influenced by social processes and the interests of various stakeholders. In the context of Nigerian libraries, this theory will help examine how library professionals, policymakers, and users shape the integration and use of AI technologies. By incorporating these theories, the study will investigate the complex interplay between technological innovation (AI), organizational structures (libraries), and social factors in Nigerian libraries. These elements provide a comprehensive framework for analyzing the current impact of AI on library services in Nigeria, offering valuable insights into the challenges and future prospects for technological integration within the country's library systems.

Literature Review

AI technologies, particularly machine learning and natural language processing (NLP), have been increasingly employed in

library cataloging systems to enhance resource discovery and management. According to Zhang and Lee (2023), AI-based cataloging systems can automatically classify materials and generate metadata, thus reducing the manual effort required by librarians. The use of AI in this domain has improved the accuracy and speed of cataloging, ensuring that resources are more easily accessible to users. Additionally, AI systems can predict which resources are likely to be in high demand, optimizing the library's resource allocation (Choi & Lee, 2024).AI has also played a pivotal role in personalizing library services. By analyzing user data, AI can recommend resources tailored to individual preferences and academic needs. In a study by Kumar et al. (2022), AI-powered recommendation systems were found to increase user engagement by suggesting relevant books, journals, and articles based on users' previous interactions. Polo et al (2024) opined that advanced technologies such as artificial intelligence (AI) and information communication technology (ICT) have changed the operational environment and landscape of the academia, which has the primary goal of inspiring knowledge in society by building human capacity and development through research.

These personalized services help libraries improve user satisfaction and engagement, making them more efficient in meeting the needs of their patrons.

The use of AI-driven chat-bots and virtual assistants in libraries has revolutionized information retrieval and customer service. According to Patel et al. (2024), AI chat-bots have significantly reduced the workload of librarians by answering routine queries and providing immediate assistance to library users. These AI-powered tools can assist with book searches, reservations, and even guide users through complex library systems. Moreover, AI-based search engines in libraries are increasingly able to understand complex queries, thus improving the precision of information retrieval (Chen & Wang, 2023).

Despite the numerous benefits, the integration of AI in libraries is not without its challenges. A major concern is the lack of technical expertise among library staff. According to Dlamini et al. (2023), many librarians in developing regions lack the necessary training and skills to implement and manage AI technologies. This skills gap hinders the widespread adoption of AI, particularly in less technologically advanced libraries.

Another challenge is the issue of data privacy and ethical concerns. Libraries must balance the use of AI for service personalization with the need to protect users' personal information. As noted by Smith and Nair (2025), AI systems in libraries often rely on user data, which raises concerns about data security, user consent, and the potential for algorithmic bias.

The future of AI in libraries looks promising, with ongoing advancements in AI technologies set to further enhance library services. Advances in AI-powered predictive analytics could allow libraries to anticipate users' needs even before they make specific requests (Nguyen & Tran, 2024). Furthermore, AI may be used to enhance accessibility for users with disabilities by providing personalized content delivery methods, such as text-to-speech for visually impaired individuals.

Libraries are also likely to see increased collaboration with tech companies and academic institutions to foster research and development in AI. According to Zhao and Li (2024), partnerships between libraries and tech companies can lead to the development of more sophisticated AI tools that can support library management, improve service delivery, and expand the range of available resources.

1. **AI Adoption in Nigerian Libraries**
   In Nigeria, the use of AI in libraries is still in its early stages, with only a few institutions exploring its potential. A study by Okeke and Anasi (2022) found that Nigerian academic libraries are gradually adopting AI, especially in the areas of cataloging and

user services. However, the study also highlighted significant barriers, such as limited funding, low awareness, and resistance to change among library staff. Similarly, a study by Eze and Ugwu (2023) emphasized the importance of partnerships in advancing AI adoption in Nigerian libraries. These partnerships with international organizations and tech providers have allowed some libraries to access AI tools and training, yet the study also stressed the need for government support and policy frameworks to create a more conducive environment for AI integration. Additionally, the literature highlights the importance of addressing ethical concerns related to AI, such as data privacy and algorithmic bias. In a study on African libraries, Mabawonku (2021) argued that ethical issues must be prioritized to ensure that AI technologies are applied responsibly and equitably. This is particularly crucial in Nigeria, where issues of trust and transparency are central to the successful implementation of AI-driven solutions.

2. Global Impact of AI on Library Services

AI technologies have dramatically transformed library services worldwide, enabling libraries to automate routine tasks, enhance user experiences, and improve the management of information resources. One of the most prominent applications of AI is the use of AI-powered chat-bots, which provide round-the-clock user support by answering frequently asked questions and helping users navigate library resources (Aina, 2020). Additionally, machine learning algorithms are being employed to develop intelligent recommendation systems that tailor content to users based on their search history and preferences (Zhang & Liu, 2021). Beyond user services, AI has optimized back-end operations such as cataloging, classification, and metadata management. Automated systems now handle vast amounts of data more accurately and efficiently, easing the workload of library staff and reducing the risk of errors (Chen & Chen, 2022). Furthermore, AI has facilitated the creation of digital libraries and repositories, making information more accessible to users remotely. These innovations have positioned libraries as dynamic, user-focused environments that are better prepared to meet the evolving demands of the digital age.

1. AI in Developing Countries Libraries

While the adoption of AI in libraries has seen notable success in developed nations, its uptake in developing countries, including Nigeria, has been slower due to a range of challenges. Studies have identified infrastructural issues, such as unreliable power supply and poor internet connectivity, as major obstacles to the successful implementation of AI technologies (Ojedokun & Ezeani, 2021). Additionally, the lack of technical skills and training among library professionals has hindered the effective use of AI tools. However, research also points to the potential of AI to address some of the persistent challenges faced by libraries in these regions. For instance, AI can help alleviate resource scarcity by enabling libraries to digitize their collections and offer remote access to materials (Adeleke, 2023). AI-driven analytics can also provide insights into user behavior and preferences, allowing libraries to better tailor their services to meet the unique needs of their communities. Moreover, AI in resource management can help optimize the allocation of limited budgets, ensuring more efficient use of available resources.

Methodology

This study utilized a mixed-methods approach, combining quantitative surveys and qualitative research with library

professionals across Nigeria. Documentary evidence was gathered from academic, public, and special libraries to evaluate the current state of AI adoption and its impact on service delivery. The survey collected quantitative data on the types of AI tools used, the extent of adoption, and the perceived benefits and challenges. The documentary evidence offered qualitative insights into the experiences and perspectives of library professionals, highlighting their views on the barriers to AI adoption and potential strategies for overcoming these challenges

Findings and Discussion

The documentary findings highlight the transformative potential of Artificial Intelligence (AI) in Nigerian libraries, as well as the significant challenges that impede its broader adoption. This section presents the key findings, organized into thematic areas, and explores their implications for library services in Nigeria.

- **Current State of AI Adoption in Nigerian Libraries**

  - The study reveals that AI adoption in Nigerian libraries is still in its early stages, with only a few institutions, mostly academic libraries, experimenting with AI-powered tools. These tools are primarily employed for basic functions such as automated cataloging, digital archiving, and user support through chat-bots. For instance, some universities have implemented AI-driven chat-bots to assist students with library inquiries, thereby reducing the workload of library staff and improving response times. However, the majority of libraries in Nigeria, especially public and community libraries, have yet to adopt AI technologies. This delay is largely attributed to a lack of awareness about the potential benefits of AI and limited access to the necessary infrastructure. Many library professionals reported being either unaware of AI applications or lacking the technical expertise required to implement them effectively. Despite the slow pace of adoption, the study identified several opportunities for AI to enhance library services in Nigeria:

- **Improved Efficiency in Cataloging and Resource Management:**

  - AI-powered tools can automate time-consuming tasks such as cataloging, classification, and metadata management. This not only reduces the workload on library staff but also improves the accuracy and consistency of library records. For instance, machine learning algorithms can analyze and categorize large volumes of data, making it easier for users to locate resources.

- **Remote Access to Resources**:

  AI-driven digital libraries and repositories allow users to access information remotely, which is especially beneficial in Nigeria, where physical access to libraries can often be restricted. By digitizing collections and utilizing AI for search and retrieval, libraries can broaden their reach, providing access to resources for a wider audience and helping to bridge the gap in resource availability.

- **Data-Driven Decision Making**:

  AI-powered analytics can provide libraries with valuable insights into user behavior, resource usage, and service effectiveness. Such data helps inform decision-making processes, enabling libraries to allocate resources more efficiently and tailor their services to better meet the needs of their communities.

- **Challenges Hindering AI Adoption:** The study also highlighted several key barriers to the successful implementation of AI in Nigerian libraries:

  - **Inadequate Infrastructure**: Many libraries in Nigeria lack the necessary infrastructure to support AI technologies, including reliable internet access, electricity, and computing resources. Without these essential components, the adoption and

implementation of AI tools remain impractical for many institutions.

- **Limited Technical Expertise**: A large number of library professionals in Nigeria lack the technical skills necessary to implement and manage AI systems. The skills gap is compounded by the scarcity of training programs and professional development opportunities specifically focused on AI and digital technologies.
- **Funding Constraints**: The high cost of AI technologies, coupled with the limited budgets of many Nigerian libraries, poses a significant challenge. Most libraries struggle to secure sufficient funding for routine operations, let alone for investing in advanced technologies like AI.
- **Resistance to Change**: Some library staff expressed resistance to adopting AI, citing concerns about job displacement and the perceived complexity of new technologies. This resistance underscores the need for effective change management strategies to foster trust and encourage the acceptance of AI among library professionals.
- **Ethical and Privacy Concerns**: The use of AI in libraries raises several ethical issues, including data privacy, algorithmic bias, and transparency. Participants in the study emphasized the importance of addressing these concerns to ensure that AI technologies are implemented responsibly and equitably.

➢ **Strategies for Overcoming Challenges:** To address these obstacles and fully leverage the potential of AI, the study proposes several strategies:

- **Capacity Building and Training**: Libraries should invest in comprehensive training programs to equip their staff with the necessary skills to implement and manage AI technologies effectively. Partnerships with academic institutions and technology providers can facilitate knowledge transfer and capacity building.
- **Infrastructure Development**: Government and other stakeholders should prioritize investments in infrastructure, such as reliable internet connectivity and uninterrupted power supply, to create an environment conducive to AI adoption.
- **Funding and Resource Mobilization**: Libraries should explore diverse funding sources, including grants, partnerships, and collaborations with the private sector, to secure financial support for the adoption of AI technologies.
- **Policy and Regulatory Frameworks**: Policymakers should create national AI strategies that include libraries as key stakeholders. These strategies should address ethical concerns and establish guidelines for the responsible use of AI in libraries.
- **Awareness and Advocacy**: Raising awareness about the benefits of AI among library professionals and other key stakeholders is crucial for driving adoption. Advocacy efforts should focus on the transformative potential of AI and address concerns about job displacement and the impact on library services

Discussion

The study's findings highlight the transformative potential of Artificial Intelligence (AI) in Nigerian libraries, particularly in overcoming long-standing challenges related to resource management, user engagement, and accessibility. However, the slow pace of adoption emphasizes the need for a strategic, inclusive approach to integrating AI into library services.

1. Transformative Potential of AI in Nigerian Libraries: AI offers Nigerian libraries an unprecedented opportunity to modernize their operations and improve service delivery. Automating routine tasks such as cataloging, classification, and metadata management can significantly reduce the workload on library staff, allowing them to focus on more strategic and

user-centric tasks. AI-powered chat-bots, for example, can handle repetitive inquiries, enabling librarians to engage in more meaningful interactions with users.

Furthermore, AI-driven recommendation systems can personalize library services, enhancing user satisfaction and engagement. In a resource-constrained environment like Nigeria, AI can help optimize the allocation of materials and services by providing data-driven insights into user behavior and resource utilization. This enables libraries to make informed decisions about which materials to acquire, how to organize collections, and how to better meet the needs of their communities.

The ability of AI to enable remote access to resources is especially significant in Nigeria, where access to physical libraries may be limited due to geographic, infrastructural, and socio-economic barriers. By digitizing collections and employing AI for efficient search and retrieval, libraries can reach a larger audience, including students, researchers, and community members in underserved and rural areas. This aligns with global trends toward digital transformation and increasing demand for remote access to information.

2. Challenges to AI Adoption in Nigerian Libraries: Despite the many benefits, the adoption of AI in Nigerian libraries faces significant hurdles. One major obstacle is the lack of adequate infrastructure, including reliable electricity and internet connectivity. Many libraries, particularly those in rural areas, face frequent power outages and poor internet access, which makes the implementation and ongoing use of AI technologies difficult.

Another critical challenge is the limited technical expertise among library professionals. Although some librarians understand the potential of AI, many lack the skills and knowledge needed to effectively implement and manage AI systems. This skill gap is compounded by the lack of training programs and professional development opportunities focused on AI and digital technologies. Funding constraints also present a major obstacle. Many libraries in Nigeria operate on tight budgets, which make it challenging to invest in costly AI tools and technologies. The high cost of these technologies, combined with the need for continuous maintenance and upgrades, further exacerbates this issue. Resistance to change is also a notable barrier to AI adoption. Some librarians expressed concerns about job displacement and the complexity of new technologies. This highlights the importance of employing change management strategies to build trust and facilitate the acceptance of AI among library staff.

Finally, ethical concerns related to AI adoption, such as data privacy, algorithmic bias, and transparency, need to be addressed. In Nigeria, where issues of trust and transparency are crucial, libraries must prioritize these ethical considerations to ensure that AI technologies are deployed in a responsible and equitable manner.

3. Broader Socio-Economic Context: The adoption of AI in Nigerian libraries must be considered in the broader socio-economic context of the country. Nigeria, a developing nation, faces significant disparities in access to education, technology, and infrastructure. While urban centers like Lagos and Abuja have better access to technology and internet connectivity, rural and underserved areas often lack even the most basic infrastructure. This digital divide creates a major barrier to equitable AI adoption in Nigerian libraries. Without targeted interventions to bridge this gap, the benefits of AI may be confined to a small, urban-based segment of the population, exacerbating existing inequalities. Nevertheless, AI adoption in libraries holds the potential to contribute to Nigeria's socio-economic development. By improving access to information and knowledge, libraries can support education, research, and innovation—key drivers of economic growth. AI-powered libraries can also

play a role in achieving the United Nations Sustainable Development Goals (SDGs), particularly Goal 4 (Quality Education) and Goal 9 (Industry, Innovation, and Infrastructure).

4. Strategic Pathways for AI Adoption: To overcome these challenges and maximize AI's potential, Nigerian libraries must adopt a strategic, collaborative approach. This includes:

- **Capacity Building**: Invest in training programs to develop staff skills for implementing and managing AI technologies.
- **Infrastructure Development**: Ensure investments in reliable internet connectivity and electricity, creating an environment conducive to AI adoption.
- **Funding and Resource Mobilization**: Explore alternative funding sources, including grants, private sector collaborations, and international partnerships.
- **Policy and Regulatory Frameworks**: Develop national AI strategies that include libraries and provide guidelines for responsible AI use.
- **Awareness and Advocacy**: Raise awareness among library professionals and stakeholders about the benefits of AI to drive adoption.

5. Ethical and Inclusive AI Adoption: As Nigerian libraries integrate AI, ethical concerns must be prioritized. This includes ensuring data privacy, algorithmic transparency, and inclusive design, which ensures that AI systems are accessible to all users, including those with disabilities or limited digital literacy. Libraries must work closely with their communities to understand user needs and design AI-driven services that align with local values and priorities.

Conclusion and Recommendations

AI presents a significant opportunity to enhance library services in Nigeria, enabling libraries to automate tasks, personalize services, and expand access to resources. However, the integration of AI is still in its early stages, with several challenges, such as infrastructure limitations, funding constraints, and a skills gap, hindering its widespread adoption. This study has highlighted the potential of AI to revolutionize library services and outlined a comprehensive approach for overcoming the barriers to adoption. By investing in infrastructure, building technical capacity, securing funding, and fostering collaboration, Nigerian libraries can unlock the transformative potential of AI and contribute to the country's socio-economic development.

Recommendations:

1. **Invest in Infrastructure Development**

❖ Prioritize reliable internet and power supply.
❖ Equip libraries with the necessary digital tools and platforms.

2. **Build Technical Capacity**

❖ Invest in training programs for staff.
❖ Partner with academic institutions and technology providers.

3. **Secure Funding and Resources**

❖Seek government support for AI initiatives.
❖Explore partnerships with the private sector and international collaborators.

4. **Develop Policy and Regulatory Frameworks**

❖ Create a national AI strategy, including libraries.
❖ Establish standards for ethical AI use in libraries.

5. **Promote Awareness and Advocacy**

- ❖ Conduct campaigns to raise awareness of AI benefits.
- ❖ Advocate for libraries' inclusion in national AI initiatives.

6. **Foster Collaboration and Knowledge Sharing**

- ❖ Form networks for sharing resources and best practices.
- ❖ Engage with communities to ensure AI services are user-centered.

7. **Address Ethical and Social Implications**

- ❖ Ensure robust data privacy and security measures.
- ❖ Promote transparency in AI algorithms and ensure inclusivity in design.

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