



Prospect and challenges of artificial intelligence technologies in academic libraries in North East Nigeria

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ABSTRACT

The integration of Artificial Intelligence (AI) technologies into academic libraries has brought about significant transformations in information management and user services. This article explores the prospects and challenges of AI adoption in academic libraries, with a focus on North East Nigeria. The study adopts a descriptive survey research design, gathering data from 500 library staff members across three federal universities in the region. The findings reveal a positive outlook on the prospects of AI technologies in enhancing library efficiency, user support, data analysis, and resource accessibility. However, challenges such as financial constraints, limited technical infrastructure, data privacy concerns, and skill gaps among library staff are acknowledged. These challenges underscore the need for capacity building initiatives, collaborative partnerships, and policy frameworks to facilitate responsible AI integration in academic libraries. Despite the obstacles, the study concludes that AI holds immense potential for advancing academic libraries in North East Nigeria and enriching the academic experiences of students and researchers in the region. Recommendations are provided for addressing the identified challenges and maximizing the benefits of AI adoption in academic library settings.

Keywords: Artificial Intelligence (AI), Federal universities, Data analysis, Limited technical infrastructure, Financial constraints

INTRODUCTION

The subject of academic libraries has also undergone revolutionary change as a result of the development of Artificial Intelligence (AI). Basey and Umoh (2021) define academic libraries as a subset of academic disciplines that broadly deals with the organisation, access, gathering, and protection or regulation of information, whether it is in physical (for example, works of art or legal documents) or digital forms. User experiences might be altered, information retrieval processes could be improved, and library operations could be made more productive and profitable. The way that traditional library work is done today has fundamentally changed as a result of advancements in digital technology. Academic and research libraries all around the world are wired for technology and have incorporated it into all of their internal operations and activities.

According to Gujral, Shivarama and Choukimath (2020) Artificial Intelligence (AI) has apparently taken over a number of businesses. Human intellect is seen as

expanding with the help of AI. The application of AI in libraries has enabled a breakthrough in the information sector. A wide range of human talents, including reasoning, reading, speaking, grasping, remembering, making judgements, and taking part in interactive learning, can be improved by technological advancements. The use of artificial intelligence in virtual reference services is thought to offer libraries a new online service paradigm. Some of the legitimate innovations that librarians are continually utilising to engage and improve services for their consumers include virtual realities, which help users become more information literate.

The use of artificial intelligence in libraries can be seen as a collection of technologies enabling machines to sense, comprehend, act and learn and can perform administrative functions and have provided cutting edge technologies for libraries (Park, 2019). Librarianship is known as a profession known for integrating cutting edge technologies not just for information dissemination but in

terms of technology as well. Artificial intelligence have had positive impacts on academic libraries and has brought changes in search and retrieval methods, discovery search, chatbots, text and data mining (Fernandez, 2019).

Artificial intelligence has become the new emerging trend for libraries. Artificial intelligence has proven to be a breakthrough for information sectors such as law, which has had significant impacts. Artificial Intelligence (AI) refers to the development of computer systems that can perform tasks that typically require human intelligence. These tasks include understanding natural language, recognizing objects and patterns, making decisions, and learning from experience. AI has seen significant advancements in recent years, enabling it to be applied in various fields, including healthcare, finance, transportation, and entertainment (Russell and Norvig, 2016).

AI-based technologies in academic libraries have enabled advanced information retrieval techniques. Intelligent search engines, chat bots, and recommendation systems leverage AI algorithms to provide users with personalized and contextually relevant information. These systems utilize machine learning and data mining techniques to analyze user preferences, behaviors, and interactions, facilitating more accurate and tailored search results. AI also plays a crucial role in automated indexing and metadata generation, helping librarians organize and categorize vast amounts of information efficiently (O'Leary, 2020).

AI holds immense potential in Academic libraries, with potential for significant transformations. AI can enhance information retrieval, curation, collection development, metadata enhancement, text analysis, digital preservation, user services, accessibility, personalized learning, data analysis, security and privacy, content creation, language translation, preservation of indigenous knowledge, and natural language interfaces (Agrawal and Bhatia, 2017). AI can improve search engines, semantic search, and personalized recommendations, making it easier for users to find the information they need. It can also assist librarians in selecting and managing library collections, automating the process of tagging and cataloging materials, and analyzing large volumes of text for valuable insights (Bassey and Umoh, 2021). AI can also help in digital preservation by monitoring and identifying deteriorating content and assisting in the migration of digital formats.

AI can also provide 24/7 user support, making library resources more accessible to users with disabilities. It can also create personalized learning pathways and recommend resources based on a student's academic interests and progress. AI can also help in data analysis and visualization, ensuring compliance with privacy regulations. Despite the potential of AI in academic libraries, challenges such as data privacy, ethics, and

digital equity need to be addressed. Librarians and information professionals may need to develop new skills and knowledge to effectively harness AI's potential (Korinek and Stiglitz, 2017). Balancing automation and human touch is crucial to ensure AI enhances the critical role of librarians in supporting research and learning.

The adoption of Artificial Intelligence (AI) in academic libraries faces several challenges, including lack of management support, insufficient budget, and inability to keep up with new technologies. Studies suggest that AI technology may lead to polarization in the workforce and job losses, increasing inequality. The World Bank warns that developing countries may be less inclined to accept technology due to the potential for job losses. AI in academic libraries presents challenges such as inadequate infrastructure, skill gaps, job loss, unpredictable power supply, and an increase in alternative sources of information. Despite these challenges, AI has the potential to revolutionize library services and improve information management. However, ethical considerations are crucial when implementing AI technologies in academic libraries, including privacy concerns, algorithm bias, and data security issues. Despite these challenges, AI has the potential to reduce human involvement in some library tasks. These perspectives and challenges prompted this study.

Statement of the Problem

Artificial Intelligence (AI) technologies are increasingly being integrated into various sectors, including academic libraries. Nigeria, with a growing academic and research infrastructure, faces several challenges in adopting AI technologies in academic libraries. These include the lack of comprehensive AI integration, the capacity and skills gap, resource constraints, ethical and privacy concerns, user acceptance and accessibility, impact on indigenous knowledge and culture, regulatory and policy frameworks, and sustainability.

In Nigeria, the successful implementation of AI in academic libraries especially in libraries in universities in North East Nigeria requires a workforce with the necessary skills and expertise. The country faces challenges in building a workforce capable of developing, implementing, and maintaining AI solutions in libraries. Addressing these challenges is crucial to ensure responsible and transparent AI usage, protecting users' rights and data privacy. User acceptance and accessibility are critical factors for success. Understanding the expectations, concerns, and accessibility issues associated with AI-powered libraries is essential. The potential impact of AI on the preservation and dissemination of indigenous knowledge and culture is another concern.

The study should assess the adequacy of existing frameworks and explore the need for AI-specific policies and regulations in Nigeria. Ensuring the long-term sustainability of AI integration in academic libraries is crucial, including funding, maintenance, and adaptability to evolving AI technologies. Understanding these challenges and prospects is essential to inform policies, strategies, and best practices for the effective integration of AI technologies in Nigerian libraries and information institutions.

Purpose of the Study

- To determine the prospects of artificial intelligence technologies in academic libraries in North East Nigeria.
- To examine the challenges of artificial intelligence technologies in academic libraries in North East Nigeria.

Research Questions

- What are the prospects of artificial intelligence technologies in academic libraries in North East Nigeria?
- What are the challenges facing artificial intelligence technologies in academic libraries in North East Nigeria?

LITERATURE REVIEW

Prospect and Impact of Artificial Intelligence on Academic Libraries

Artificial intelligence has become the new emerging trend for libraries. Artificial intelligence has proven to be a breakthrough for information sectors. Artificial intelligence has had positive impacts on academic libraries and has brought changes in search and retrieval methods, discovery search, Chatbots, text mining, and data mining. The prospect of Artificial Intelligence (AI) in Library and Information Science (LIS) in the 21st century is substantial (Bawden and Robinson, 2019). The rapid advancements in technology, particularly in the field of Artificial Intelligence (AI), have had a profound impact on various industries. In the 21st century, libraries and information science have also embraced AI to enhance their operations, improve user experiences, and optimize information retrieval processes. The 21st century has witnessed the rapid adoption of Artificial Intelligence (AI) in the field of Library and Information Science (LIS).

AI technologies have revolutionized traditional library services, enhancing information retrieval, knowledge organization, and the user experience. AI-powered systems, such as natural language processing and machine learning algorithms, have significantly improved the efficiency and effectiveness of library operations, leading to improved access to information for users (Kumar and Rani, 2018). AI-based technologies in LIS

have enabled advanced information retrieval techniques. Intelligent search engines, chat bots, and recommendation systems leverage AI algorithms to provide users with personalized and contextually relevant information. These systems utilize machine learning and data mining techniques to analyze user preferences, behaviors, and interactions, facilitating more accurate and tailored search results. AI also plays a crucial role in automated indexing and metadata generation, helping librarians organize and categorize vast amounts of information efficiently.

AI technologies have the potential to revolutionize various aspects of LIS, including information retrieval, cataloging and classification, user services, data analysis, and knowledge management (Chandrashekara and Bhunika, 2018). Here are some key areas where AI can make a significant impact:

Information retrieval: AI can enhance information retrieval systems by improving search algorithms, natural language processing, and recommendation systems. AI techniques such as machine learning and deep learning can help in understanding user preferences, context, and semantic meaning, leading to more accurate and personalized search results.

Cataloging and classification: AI can automate the cataloging and classification process, making it more efficient and accurate. Machine learning algorithms can analyze and extract metadata from various types of documents, reducing the manual effort required for cataloging. AI can also assist in automated subject indexing and classification of resources based on their content.

User services: AI-powered virtual assistants and chatbots can provide personalized assistance to library users. These virtual assistants can answer queries, provide recommendations, and guide users through the library's resources and services. Natural language processing and machine learning techniques enable virtual assistants to understand and respond to user queries effectively.

Data analysis: Libraries generate vast amounts of data, including circulation statistics, user behavior, and resource usage. AI techniques can be applied to analyze this data and extract meaningful insights. Machine learning algorithms can identify patterns, trends, and correlations in the data, enabling libraries to make data-driven decisions for collection development, service improvement, and resource allocation (Thakur, 2019).

Knowledge management: AI can aid in knowledge organization and management by automating processes such as text summarization, information extraction, and knowledge discovery. These capabilities can support efficient knowledge sharing and collaboration among library professionals and researchers.

Challenges in the Adoption of Artificial Intelligence in Academic Libraries

Many issues and challenges prevent the full integration of cutting-edge technology, such as artificial intelligence, with library and information work. These issues typically arise in Nigerian academic and research libraries. Several of the challenges associated with adopting AI in libraries have been highlighted by CILIP and other organizations. These include, lack of management/executive support, insufficient budget and funding, an inability to keep up with the increasing trend in new technologies, and the challenge of implementing new technologies. Previous studies by Korinek and Stiglitz (2017) claimed that the development of AI technology may lead to polarisation in the workforce or job losses. Automation and the usage of AI may lead to a huge rise in inequality.

The World Bank asserts that developing countries may be less inclined to accept technology due to the likelihood that it will result in significant job losses. AI has the potential to cause major employment destruction as well as job losses. Using artificial intelligence in academic libraries presents a number of difficulties, according to Yusuf, Adebayo, Lateef and Kayode, including a lack of suitable infrastructure, increasing skill gaps, job loss, unpredictable power supply, and increase in the number of alternative sources of information. Nevertheless, the adoption of artificial intelligence would reduce the need for human involvement in a number of library tasks.

The adoption of Artificial Intelligence (AI) in library and information science in the 21st century presents several challenges. While AI has the potential to revolutionize library services and enhance information management, its implementation is not without obstacles. It is obvious that ethical considerations are crucial when implementing AI technologies in LIS. Privacy concerns, bias in algorithms, and data security issues pose challenges that need to be addressed.

Here are some other key challenges:

Data quality and availability: AI algorithms heavily rely on high-quality and relevant data to produce accurate results. Libraries may face challenges in obtaining and curating datasets that are comprehensive, up-to-date, and representative of their user base. Additionally, ensuring the availability and accessibility of data can be a challenge due to privacy concerns and restrictions on data sharing.

Expertise and resources: Implementing AI in libraries requires specialized knowledge and expertise in areas such as machine learning, natural language processing, and data science. Libraries may face challenges in acquiring or developing these skills within their staff.

Moreover, AI projects often require substantial financial resources for infrastructure, training, and maintenance, which can be a barrier for some libraries.

User acceptance and trust: Introducing AI technologies in library services may encounter resistance from users who are unfamiliar or skeptical about AI. Libraries need to actively engage with their user communities, provide clear explanations about the purpose and benefits of AI systems, and address concerns related to privacy, security, and human oversight to gain user acceptance and build trust.

Methodology

In carrying out this study, the descriptive survey research design was adopted. The population consisted of all the 2,354 library staff of libraries in the three federal universities in North East Nigeria. These universities are university of Maiduguri, Modibo Adama university of technology and Abubakar Tafar Balewa, university. The study adopted the Yaro Yamane formula to obtain the sample size of 500 library staff. The validated questionnaire was titled "Questionnaire on the Prospect and Challenges of Artificial Intelligence on Academic Libraries" (QPCAIAL). The questionnaire is divided into two sections; A and B. Section A contains the demographic profile of the respondents while section B is sub-divided into two clusters; I and II. Cluster I addressed 8 items on prospect of artificial intelligence on academic libraries and cluster II contained 9 items on the challenges of artificial intelligence on academic libraries. The clusters were subjected to a 4 point scale of SA (Strongly Agree), A (Agree), D (Disagree), SD (Strongly Disagree) with values 4, 3, 2 and 1 respectively. The QSMIES questionnaire was trial-tested using 20 library staff in one federal university in North Central an overall co-efficient of 0.79 was obtained using Cronbach Alpha Method. The copies of the questionnaire were administered by the researcher with the help of three research assistants. The descriptive statistics of mean and standard deviation was used to answer the research questions. Any mean score below 2.50 thresholds was rated disagreed while mean scores with 2.50 were rated agreed.

RESULTS AND DISCUSSION

Data in Table 1 revealed that all the items 1-7 with their respective mean scores of 3.23, 2.71, 3.13, 2.81, 3.00, 2.69 and 2.84 were rated agreed by the respondents. The cluster mean of 2.91 revealed that respondents agreed on the prospects of artificial intelligence technologies in academic libraries in North East Nigeria.

Table 1: Respondent's mean and standard deviation ratings on the prospects of artificial intelligence technologies in academic libraries in North East Nigeria.

S. no	Items on prospect of AI technologies in academic libraries	X	SD	Remarks
1	AI technologies (such as chatbots, data analysis) can improve the efficiency and effectiveness of academic library services and resources.	3.23	1.63	Agreed
2	AI technologies can help academic libraries in Nigeria keep up with the evolving information and technology landscape.	2.71	0.94	Agreed
3	AI-powered services can enhance the accessibility and convenience of academic library resources for users.	3.13	1.59	Agreed
4	AI technologies can help enhance user support and chatbots.	2.81	0.89	Agreed
5	AI technologies can help enhance data analysis and visualization.	3	1.15	Agreed
6	AI can provide personalized recommendations and tailored services based on individual user preferences and behavior, improving the overall librarian's experiences.	2.69	0.91	Agreed
7	AI can analyze usage patterns and academic trends to recommend the acquisition of new materials and the removal of outdated ones.	2.84	0.85	Agreed
	Cluster mean	2.91		Agreed

Data in Table 2 revealed that all the items 8-15 with their respective mean scores of 2.69, 2.93, 2.88, 2.75, 2.73, 2.74, 3.02 and 3.11 were rated agreed by respondents. The cluster means of 2.86 means that respondents

agreed on the challenges facing artificial intelligence technologies in academic libraries in North East Nigeria.

Table 2: Respondent's mean and standard deviation ratings on the challenges facing artificial intelligence technologies in academic libraries in North East Nigeria.

S. no	Items	X	SD	Remarks
8	Lack of financial resources	2.69	0.99	Agree
9	Limited technical infrastructure	2.93	1.01	Agree
10	Data privacy and security concerns	2.88	0.99	Agree
11	Ethical concerns related to AI	2.75	0.94	Agree
12	Lack of AI expertise among library staff	2.73	0.89	Agree
13	Resistance to change from library staff	2.74	0.88	Agree
14	User acceptance and familiarity with AI	3.02	0.92	Agree
15	Access to quality data	3.11	0.82	Agree
	Cluster mean	2.86		Agree

The finding in research question one revealed that respondents agreed on the prospects of artificial intelligence technologies in academic libraries in North East Nigeria. It means they share a common positive outlook on the potential benefits and opportunities that AI can bring to their libraries in that specific region. Librarians believe that AI aligns with their libraries' goals and missions, which may include providing high-quality services, supporting research and education, and staying relevant in the digital age. This finding aligned with that of Bassey and Owushi that artificial intelligence impacted library and information science in the 21st century especially on information retrieval, cataloguing and classification, user services, data analysis and knowledge management. The finding supported that of Liu, Liu and Chen, Brown and Rojas, Hermosilla, Yunge and Farias that the application of AI in information retrieval showed significant improvements in university libraries' comprehensive management ability and user experience. The analysis emphasised the role of AI in enhancing information retrieval capabilities, providing personalised services, and integrating multiple retrieval methods in the digital library environment.

The finding in research question two revealed that respondents agreed on the challenges facing artificial intelligence technologies in academic libraries. It means that they acknowledge and agree on specific challenges, such as financial constraints, limited technical infrastructure, data privacy and security concerns, ethical considerations, lack of AI expertise among library staff, and resistance to change. This finding agreed with the

finding of Bassey and Umoh that challenges such as data quality and availability, expertise and resources and user acceptance and trust were faced by artificial intelligence in library and information science. The finding also was in line with that of Ali, Naeem, Bhatti and Richaedson that the sluggish adoption of AI technology by Pakistani university libraries' administration, but financial, infrastructural, and technical talent issues remain and must be resolved.

CONCLUSION

In conclusion, the prospects of AI technologies in academic libraries in North East Nigeria are promising, offering the potential for enhanced services, resource management, and research support. However, these prospects must be balanced against the challenges posed by financial constraints, infrastructure limitations, and concerns related to data privacy, skills development, and user acceptance. Addressing these challenges and maximizing the benefits of AI in academic libraries will require a collaborative effort involving libraries, institutions, and policymakers, with a focus on responsible AI integration and user-centric services. With careful planning and investment, AI can play a transformative role in advancing academic libraries in North East Nigeria and enriching the academic experiences of students and researchers in the region.

RECOMMENDATIONS

Based on the findings, the following recommendations were made:

- Academic libraries in North East Nigeria should prioritize training and capacity building programs for library staff to bridge the AI skills gap. This can include workshops, courses, and access to online resources on AI and its applications in libraries.
- Libraries in North East Nigeria should explore collaboration with academic and research institutions, as well as international organizations, to pool resources and knowledge for AI adoption. Collaborative efforts can help address financial and infrastructure constraints.

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