ADOPTING ARTIFICIAL INTELLIGENCE IN ACADEMIC LIBRARY SERVICES IN NIGERIA: REQUIREMENTS AND CHALLENGES

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Abstract

The purpose of this research is to identify the variables that make up the essential prerequisites for implementing artificial intelligence (AI) in Nigerian academic libraries, as well as the concerns that offer challenges to the process. The exploratory research approach was used in conjunction with a comprehensive literature review on the notion of AI, its potential, implications, and modalities of application in libraries; identification of the prerequisites for AI adoption and the challenges to its successful implementation in Nigerian libraries. The findings revealed that adoption of AI in Nigerian libraries requires the availability of policy documents/frameworks, digital infrastructure facilities, human capital development and expertise as well as generation of data for training in AI application and ensuring the security/privacy of data. The challenges include high cost of establishing an AI system; a lack of technical skills and fear of job loss; insufficient technological infrastructure and erratic/unreliable power supply. It was recommended, among others, that the government and university authorities should provide adequate financial support for the effective implementation of AI technology in libraries. Also library administrations should engage in adequate training and manpower development initiatives to prepare librarians to adopt AI technology in library operations and services.

.***Keywords: Academic libraries, Artificial Intelligence, Library services, Machine learning.***

Introduction

ICT and the accompanying technological advancements have regularly resulted in significant informative changes in library operations and services throughout time. The library is a critical organ tasked with supporting scholarship in the parent institution by providing effective and efficient access to information. The modern academic library has struggled to keep up with the many technical breakthroughs that occur in the information world in order to remain relevant in its functions of supporting teaching, learning, and research. In other words, the use of digital technology in libraries is always expanding at a rapid pace, resulting in regular changes in the mode of information service delivery, primarily through automation. Tracing the evolving stages

of automating the academic library, Memela (2023) asserts that academic libraries evolved from card system to computer to digitization to electronic resources to radio frequency identification (RFID) and to artificial intelligence (AI), which according to the author, has raised the bar of effectiveness and efficiency of library operations and services.

Artificial Intelligence, which is the latest in the development, has been viewed as one of the evolutionary technological tools that has brought about tremendous change in the operations and services of the library. As a result, most academic libraries throughout the world regard AI adoption as a developing strategy that provides ease of operations and services (Eirimiokhale and Sulyman, 2023). With the advancement of AI, library functions are growing more complicated, and librarians must stay up with the growth and adjust library processes and services accordingly. This could be accomplished by demonstrating a high level of devotion in service design and execution, as well as being proactive and creative in work techniques. With the advancement of AI, library functions are growing more complicated, and librarians must stay up with the growth and adjust library processes and services accordingly. This could be accomplished with a high level of devotion in the design and implementation of services by being proactive and inventive in work techniques.

However, the level of adoption of AI in Nigerian libraries is low, as indicated by the findings of Odeyemi (2019), Ajani et al. (2022), Yusuf et al. (2022), and Oyekale (2023). This circumstance raises concerns regarding the feasibility of its full implementation in academic libraries as a means of keeping up with global trends and giving libraries a competitive advantage in information access initiatives. The work therefore aims at examining the

requirements and challenges of successful adoption of AI in the operations and services of the academic libraries in Nigeria, anchoring on the following issues:

1. The Concept of Artificial Intelligence
2. Objectives, prospects and impacts of AI in academic libraries.
3. Modes of application of AI in academic library services.
4. Requirements for AI application in academic libraries
5. Challenges of adopting AI in academic libraries.

The Concept of Artificial Intelligence

Artificial intelligence is described as a broad term that encompasses a variety of technologies, including business analytics and data science; natural language processing; speech recognition and text speech; machine learning; deep learning and neutral networks; machine reasoning, decision-making, and algorithms; computer vision and robotics (Lowendal and Calhoun Williams, 2018). Similarly, Bughin et al (2018) describe AI capability as being made of machine learning; natural language text understanding; virtual agents or conversational interfaces; physical robots, natural language speech understanding; natural language speech generation and autonomous vehicles. The descriptions above depict that the scope of AI is broad and is modeled after multidisciplinary concepts, viewpoints and practices; from the field of Philosophy (logic and reasoning), Mathematics, Psychology, Linguistics and Computer Science (Amudha, 2022) and can be applied across different sectors beyond the library. In simple terms, Memela (2023) describes AI as the progression of computer system that are capable of executing tasks that normally require human intelligence, such as decision-making, object detection and solving complex problems. This implies that the technology displays a high level of intelligence similar

to humans in decision - making and problem solving. Hence, the core of artificial intelligence is a combination of many abilities such as thinking, reasoning, comprehension, learning, judgments and inference, which are human attributes.

Though the use of AI has not gained much popularity in Nigeria, it is regarded as part of the 4th industrial revolution (Park, 2019) and originated from the assumption of John McCarthy in 1956 who states that every aspect of learning and other forms of intelligence can be simulated through the use of machine (Wang, 2018). The originator further defines AI as the 'Science and Engineering of making intelligent machines, particularly intelligent software' with the goal of using the computer to study the intelligence and associated decision making skills of humans (Amudha, 2022). Theoretically, the field of AI was started from the realization that computers, though initially designed to do numerical calculation, can be made to carry out other mental activities such as theorem proving and playing, which are hard intellectual problems that are usually considered as demanding intelligence. This implies that the theory of artificial intelligence is centered on the mix between human intelligence and computer intelligence.

Objectives, Prospects and Impacts of AI in academic libraries

Artificial intelligence has been identified as a technology that has revolutionized the processes and services of the library in recent time, with the objective of improved search and discovery of materials; personalized library services; digitization and preservation of library materials; and supporting inclusiveness in accessibility of library resources (Halburagi, Suryakanth & Mukarambi, 2023). In the opinion of Cox (2022) AI is important in the mining of published literature. Given the tremendous increase in the quality of published works, it is always challenging for researchers to engage in systematic review of all. Hence scholars in many fields

turn to AI to cope with the massive literature. The implication is that users can access library collections through machine learning, which makes it easy for them to navigate the entire collection with ease, rather than searching a library catalogue to locate a book manually.

Commenting on the potentials of artificial intelligence to the progress of academic libraries, Memela (2023) describes it as the new hope for the libraries for provision of automated services to users as it is one of the technologies that has risen to play a major role in the upcoming 5th industrial revolution. According to a study conducted by Ogwo, Ibegbulem, and Nwachukwu (2023), artificial intelligence has the potential to increase productivity, improve customer satisfaction through personalized service, make information more easily available and accessible, and facilitate collaboration and knowledge sharing. In the same vein, Olayode (2023) reveals that AI technology has the potential of simplifying library functions, enhancing librarian's efficiency, and promoting quality service delivery. Omame and Alex-Nmecha (2020) in an earlier study, assert that error-free operations, working all round the clock without getting tired unlike humans, freeing the librarian to do more demanding jobs, speed, efficiency and effectiveness are the potentials of application of AI in libraries. From the foregoing, AI has the potential to improve service delivery, enhance decision-making, and provide innovative library services, which in turn provide value-added services, foster digital transformation, and enhance service provision.

Fundamentally, artificial intelligence can analyze texts, make knowledge models, and use machine learning to make decisions and produce knowledge. In specific terms, AI chatbots (ChatGPT) can be incorporated into the daily workflow of library work, providing practical tools for specific tasks. Also, Artificial intelligence capabilities include robotic process automation,

computer vision, machine learning, natural language text understanding, virtual agents/conversational interfaces, physical robots, natural language speech understanding, natural language generation, and self-driving vehicles (Bughin et al, 2018). To summarize, according to Balsubramanian and Tamilselvan (2023), the impact of AI on library operations and services manifests itself in the following ways:

Enhanced search and discovery: AI powered system can assist users to find relevant resources more quickly and easily, analyzing search behavior of users, identifying search patterns and suggesting resources that may be of interest to users, as well as real-time query resolution and individualized, responsive customer care.

Collection Management: AI can help in the selection and acquisition of library resources by analyzing usage data, identifying popular items, and predicting future demand, allowing the library to make more informed decisions about which resources to purchase while also allocating fund more efficiently.

Processing and organizing library resources: AI facilitates the cataloging and classification of library items, lowering the time and effort required to handle and arrange collections.

Inclusive Information Accessibility: AI enables more inclusive access to resources and services, particularly for the challenged, by providing alternate text and audio description, automatic translations, and other assistive technology.

Preservation of Resources: AI can digitize and preserve library items, lowering the risk of loss or damage to physical documents and making them more publicly available and usable in the future.

Data Analysis: AI can be used to evaluate library data such as circulation statistics, user activity, and resource utilization to detect patterns and generate insights that can help with decision-making and service enhancement.

In conclusion, Subaveerpandiyan (2023) discovered that AI can improve information retrieval, automate library routines, personalize user interaction, and provide innovative services, and that AI powered Chatbots (ChatGPT) can effectively handle user queries and provide instant assistance, thereby improving overall user satisfaction.

Modes of application of AI in academic library services.

Application of AI technology in libraries is possible through different modes. Different studies by Yu et al (2019), Ali et al (2020), Oname and Alex-Nmecha (2020) and Olayode (2022) identified several AI technology modes that can be adopted in libraries to include, robots, chatbots, expert self -reading system, book-reading bots, facial recognition, google-chat, google drive, drive one, big data, cloud computing, thumb google translator RFID. Hence AI can be applied in different varieties of library services. Specifically, Adetayo (2023) identifies Chatbots (ChatGPT) as valuable tool of artificial intelligence that can be applied in library service delivery. According to the author, this tool provides rapid and accurate responses to user's queries, offering convenience and accessibility outside the traditional library and hours. The tool possesses advanced language processing capabilities that provide human-like and contextually relevant responses, making it a useful virtual assistant. By implication, AI technologies can be applied in diverse library services and operations.

Commenting on different services and operations applicable to AI in libraries, Nawaz, Gomez, and Saldin (2020) and Moustapha and Yusuf (2023) identified automating library

routines, user identification in speech or typing recognition, monitoring users as they use library resources and services, reference services, library security/surveillance, teaching and assisting librarians , online messaging, AI alarms to remind users of closing time, AI based tutorial to keep users abreast of latest discoveries in the field, as different library services and operations related to AI application. In technical services, AI can be used to assign and create subject headings, taxonomies, and Meta data descriptions, while librarians operate as moderators and regulators of metadata ethics and privacy in apps (Corrado, 2021). Similarly, Mughalu (2019) found out that AI can be used for expert system in the library in the area of research, indexes, online reference and responsibilities linked to acquisition, cataloguing, and classification.

Studies by Lie et al, (2019), Kaushal and Yadav (2022), Balsubramanian and Tamilselvan (2023) and Halburagi and Mukarambi (2023) identified and explained in the details the modes of application of AI in library operations and services as follows:

Chatbots: This is virtual assistant software that gives customers with rapid assistance by answering their questions and referring them to resources, minimizing library staff workload and increasing user experience.

Analysis of user behavior using algorithms: This entails analyzing users' search queries and reading habits to determine their interests and make personalized recommendations. The goal is to assist consumers find resources more quickly, increasing their overall satisfaction.

Automating of tasks: AI-assisted systems can automate tasks like cataloging, classification, and indexing by analyzing an item's content and creating relevant subject headings and keywords,

saving time and money while guaranteeing that library materials are accurately and fully indexed.

Analyzing User Behaviors and Preferences: User behaviors and preferences can be identified by collecting and analyzing data on how users interact with library websites, digital collections, and physical resources, allowing the library to gain insight on how to improve offerings and adjust services to better match the needs of its users.

Digital Preservation: Libraries have faced challenges in ensuring the long-term preservation of digital information. AI technology ensures that the process of discovering and fixing faulty files, as well as optimizing storage, is completed for preservation of materials for the future. From the foregoing, it is clear according to Halburagi and Mukarambi (2023) that AI technology is designed to operate autonomously or with minimal human supervision by analyzing complex information, recognizing patterns, and making predictions and recommendations.

Requirements for AI application in academic libraries

The adoption of any innovation in any field including the library requires some level of preparations for its successful implementation and sustenance. Weija (2022) as cited by Subaveerpandiyan (2023) investigated the elements that influence libraries preparedness to adopt AI. Leadership was proven to be the most essential factor, along with expertise with AI applications, acceptance of AI, and awareness of AI, as well as the atmosphere of innovation. The report proposes that library management be up to date on the latest developments and routinely assess the library's readiness for AI adoption and quickly implement the technology. In addition to having a high level of awareness, library personnel should be supplied with training

and a supportive environment that fosters innovation and encourages workers to study the possibility of integrating AI.

Studies by conducted by Martinez-Plumed et al, (2021), Qomariya et al (2020), Decker (2015), Odeyemi (2019) and Owolabi et al (2022) have additionally, identified several elements that constitute the basic requirements for application of AI in libraries. These include, policy document/framework, digital infrastructure in form of application software, strong internet connectivity, expertise and skills in operating technology, human capacity and training, as well as sufficient amount of data generated and organized for the operations of the technology. The aspect of data generation entails that AI does not operate as a rocket science without human intermediary. The data for the operations of the technology are generated and possibly organized by librarians, which implies that the operations of AI technology are limited to the input by the humans (librarians and experts).Hence Neuman et al, 2022, Lund and Wang, 2023 and Oyetola et al, 2023 recommend the necessity for librarians to be proficient in data literacy, including understanding of data types, sources, quality privacy concerns and ethical considerations related to data collection and use; proficiency with digital tools and technologies, understanding coding languages, etc. In a more detailed manner, Halburagi and Mukarambi (2023) identified the following specific requirements for application of AI technology in libraries:

Data Management: A well-organized and easily available database of collections and user information to support AI applications. This can be accomplished by digitizing all library resources and guaranteeing thorough data capture for all types of users.

Robust AI Infrastructure: This involves computer hardware, software, and a reliable Internet connection.

Expertise in AI Development: Employing or contracting experts in AI development with the knowledge of AI programming language, data analytics, machine learning algorithm and related tools to build and maintain the AI system.

Data for Training: The availability of high-quality data sets for training AI models. This data must be current, relevant, and reflective of the library's collection and user population.

Data Privacy and Security: Robust data privacy and security measures should be implemented to protect user data and ensure compliance with data protection rules. **Areas of AI Application:** Specific applications of AI should be identified. This could include automation of library operations, tailored user experiences, recommendation search engines, and other AI-powered library services.

Integrating AI with existing library systems: Integrating AI technology into existing library systems will minimize operational disturbance, making it easier for staff and patrons to adopt the new technology. It is important to note that user training is a critical necessity for implementing AI technology in libraries. The introduction of any innovation necessitates training of both the personnel and customers to enable proper deployment and utilization of the technology.

Challenges of adopting AI Technology in Libraries

Studies in Nigerian Libraries have found out low level of adoption of AI in operations and services. The studies of Rotimi et al, (2022), Owolabi et al, 2022 and Adeyeye, et al (2023)

attested that Nigerian libraries are yet to exploit abundant opportunities offered by emerging innovations, services are still dominated by manual operations and there is obvious low level of readiness to incorporate emerging technologies in library operations and services. The above scenario implies that the possibility of adopting AI in theses libraries is slim. This could be linked to institutional inadequacies. In their analysis of the obstacles of using AI in academic libraries, Bawack and Nkolo (2018) and Tella (2020) identify institutional concerns as the most significant barrier to AI deployment in libraries, particularly in African countries.

These factors include, lack of necessary facilities, policies and 'dearth of innovative library managers' that would promote the implementation of AI technology in libraries. Similarly, different studies of Odeyemi noted a low level of and partial readiness of application of AI in libraries in Nigeria, attributing it to the challenges of financial uncertainties/high cost of implementing AI system, incomplete automation, emerging skill gaps/ absence of technical skills, fear of job loss, lack of adequate technological infrastructures and erratic/unreliable power supply. In addition to institutional factors, are the challenge of ethical concerns and privacy issues (Suberveerpandiyan, 2023) and high system development and maintenance cost, limited availability of artificial intelligence experts among library automation vendors (Omame and Alex-Nmecha (2020)). It could be deduced from the foregoing that sufficient financial provision is fundamental in successful implementation of AI technology in libraries, as in every other field. With the current economic realities and the seemingly low financial allocation to education, the possibility of full implementing AI in Nigerian educational system seems to be a mirage.

Conclusion and Recommendations.

The work has tried to examine the possibility of adopting AI technology in academic libraries in Nigeria. Application of Artificial intelligence in every aspect of societal life has come to stay and the library cannot be exempted. The presence is automatically noted through in our personal gadgets, the 'Meta AI' is always displayed in our hand phones ready to help in making any form of search. Hence the emphasis is on identifying the issues of concern in terms of requirements for its successful implementation and the inherent challenges in academic libraries. The requirements include ensuring the availability of policy document/framework, digital infrastructural facilities, human capital development and expertise, data for training in AI application and ensuring data privacy and security, among others. The identified challenges are majorly related to financial availability which invariably, depends on institutional and political will.

Based on the findings, the following recommendations are proffered:

1. Giving that huge financial commitment is involved in the development and implementation of AI technology, government should make adequate financial provisions to institutions of higher learning in Nigeria to enable them advance the course of general implementations of AI technology, especially in the area of provision of adequate AI-related infrastructural facilities both in the libraries and in other relevant administrative functions.

2. Nigerian university authorities and library administrations should, in addition to the possibilities offered by TETFUND, seek for grants and interface with other external

sources of funding like philanthropist and Non-Government Organizations for financial support in this regard.

3. The library administration should engage in adequate training and professional development of staff to ensure smooth transition to AI-enhanced operations and services. This should involve training in technology literacy and hands-on experience with AI tools. Also, librarians should have fundamental proficiency in digital tools and technologies, understanding of coding languages and on what AI is including its capabilities, limitations and its various techniques such as machine learning, natural language processing and data mining.

4. The libraries should put in place robust data protection measures to prevent breach of user privacy by ensuring the security of data and other biographical information of patrons.

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