THE CONTRIBUTION OF THEORY AND RESEARCH TO THE TRANSFORMATION OF LIBRARIES

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Capabilities and Apparent Implications of Artificial Intelligence (AI) Adoption in Nigerian Academic Libraries

Objective. This paper discusses the capabilities and implications of Artificial Intelligence (AI) in Nigerian academic libraries. The study emphasizes the importance of libraries using new technologies to improve their operations and services, especially in developing countries like Nigeria. **Methods.** The research conducted a literature review to examine the capabilities of AI in libraries and its impact on academic libraries. **Results.** Various AI tools such as natural language recognition, robotics, big data, and machine learning were identified. AI can revolutionize library services, improve information quality, increase productivity, and provide virtual assistance. However, there are challenges to the adoption of AI in Nigerian academic libraries, including high costs, resistance to change, poor network connectivity, privacy and ethical implications, and a lack of supportive cultures. To fully exploit the benefits of AI, libraries must develop plans and policies, train librarians with the necessary skills, and address the challenges associated with AI adoption. **Conclusions.** AI holds great advantages to enhancing library services in Nigeria, but careful planning and preparation are needed.
Keywords: artificial intelligence; academic libraries in Nigeria

Introduction

Libraries are constantly evolving to keep pace with technological advancements and changing information needs. The widespread use and rapid development of technology require libraries to adapt and embrace these changes in order to remain relevant and accessible. Information technology is rapidly evolving, and societies are becoming more sophisticated and competitive, relying heavily on technological advancements and the explosion of information (Thamaraiselvi2009). As a result, librarians and information professionals now work in a rapidly changing environment that requires smart and intelligent technologies to provide effective information services. Providing services that meet the changing needs of digital users has become a major challenge for libraries. Artificial intelligence (AI) has emerged as a key driver of change and development in modern society and plays a crucial role in transforming libraries into smart and intelligent institutions. AI has the advantages of transforming all aspects of human activity, including libraries and the information environment. It is considered an emerging technology that can bring new sources of growth and fundamentally change the way organizations, industries, and individuals work. In recent years, libraries have transformed from traditional repositories of information into dynamic data centers, undergoing significant changes in their operations and services. Modern technology has removed geographical barriers and made information easily accessible and rapidly movable. The impact of this technological revolution can be seen in the development of smart and intelligent technologies that enhance information intelligence, improve the organization of information resources, streamline service delivery, and enhance library management. Advanced technologies such as the Internet, big data, cloud computing, blockchain, Radio Frequency Identification (RFID), artificial intelligence (AI), and virtual/augmented reality will further shape the future library landscape (Yu, Gong, Sun, & Jiang, 2019). Libraries must adapt and embrace technological developments to remain relevant and meet the evolving information needs of their users. The integration of smart and intelligent technologies, particularly artificial intelligence, is crucial in optimizing the value of information services and enhancing their

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accessibility (Asemi As. and Asemi Ad., 2018). Continuous innovation and exploration of new technologies will be essential to keep up with the rapid advancements and define the future of library and information science. By proactively responding to these changes, libraries can position themselves as valuable resources in a digital and interconnected world. The incorporation of Information and Communication Technology (ICT) has greatly contributed to the growth and development of academic libraries in Nigeria. These libraries have embraced technology in their day-to-day operations, offering services such as computer access, scanning and printing, and online catalogs. However, the utilization of advanced technologies like the Internet of Things (IoT), big data, cloud computing, blockchain, and artificial intelligence (AI) is still limited in Nigerian academic libraries. The adoption of AI is in its infancy, and its effectiveness relies on librarians receiving the necessary training and refresher courses to acquire the technical skills and competencies required in the digital library environment. The emphasis of the traditional role of librarians has significantly changed over the past two decades therefore, librarians need to be flexible and acquire a wide range of technical skills to keep pace with current trends in the library profession. Machine learning and AI can then be used to enhance library operations and services, allowing librarians to adapt to a changing environment and meet the information needs of technology-oriented users. Despite previous studies on the impact of AI on library services, there is limited research specifically focused on its realization and apparent capabilities in Nigerian academic libraries. Therefore, the objective of this study is to investigate the position of AI realization in Nigerian academic libraries and examine the hindrances associated with its adoption. Additionally, the study aims to assess the advantages and benefits of using AI in these libraries. By doing so, it seeks to identify how AI can improve library services, enabling them to be seamless, efficient, innovative, and effective in meeting the dynamic information needs of users in the context of ICT.

Methods

The study reviewed the literature to explore the possibilities of artificial intelligence in libraries and its impact on academic libraries in Nigeria. The chronological framework for the study of professional literature: 2018-2023. The keywords used to search for literature on the topic of this study were "artificial intelligence" and "academic libraries".

Results and Discussion

The Concept of Artificial Intelligence

Artificial intelligence (AI) refers to the ability of machines to perform tasks that previously required human intelligence. This can include self-driving cars, robots, chatbots, and artificially generated images (Diaz, 2023). AI combines computers, computer-controlled robots, or software to think intelligently like humans, mimicking the problem-solving and decision-making abilities of the human brain (Duggal, 2023). It is an emerging technology that allows intelligent machines to understand reason, learn, and apply knowledge (Nwakunor, 2021). In the context of libraries, AI can be seen as a set of modern technologies that enable libraries to operate machines that can perceive, understand, act, and learn. This has implications for IT connectivity in libraries and can help meet customer demands and needs more effectively. The impact of AI and modern IT on the future of libraries is uncertain and can vary according to different experts (Vijayakumar & Cheshadri, 2019).

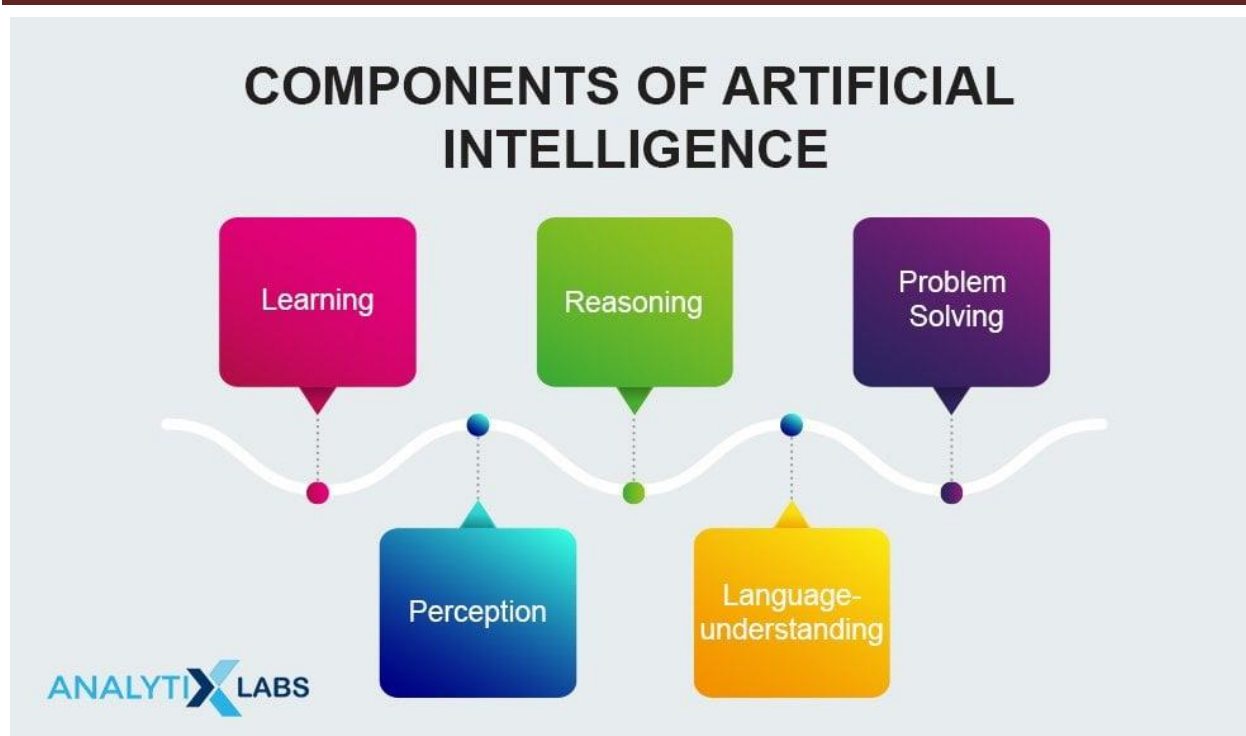THE CONTRIBUTION OF THEORY AND RESEARCH TO THE TRANSFORMATION OF LIBRARIES

Fig. 1: Component of Artificial Intelligence

Diagram of AI Components (Fig. 1) showing components of AI including learning, reasoning, problem solving, perception, and language understanding (Bansal, 2021).

Among the benefits of AI in improving library services are **automating routine tasks, expanding collections, and enhancing user experience**. However, we also have to acknowledge the **shortcomings of AI, particularly in understanding the complexity of human language and culture**. Barriers to the adoption of AI in libraries include high costs, lack of technical skills, and privacy concerns. It is emphasized that librarians should acquire the necessary skills to adapt to the evolving technological environment. AI has the advantages of significantly improving library services by providing **personalized guidance, increasing efficiency, and automating wearisome tasks**. However, it is also important to address issues that may arise, such as **work delegation and privacy concerns**. AI has the advantages of enhancing library services, but careful consideration and adaptation are necessary to overcome the challenges associated with its implementation.

Artificial Intelligence in Academic Libraries and Its Perceived Impact

AI is transforming libraries into technologically advanced and user-centric institutions. It is causing significant changes in the field of library and information profession. AI technologies are being integrated into all aspects of human activity, including **research, data collection, transfer, storage, and access to information**. The combination of machine intelligence and machine learning allows for rapid automated assessment and computer-based feedback in libraries. AI has also revolutionized education and academic libraries, transforming **teaching, learning, and research processes. Image and face recognition technologies, adaptive learning, and other AI applications** are improving the educational experience for both teachers and students. In libraries, AI technologies enable **automated assessment of practical skills and improved resource discovery**. This revolution in libraries will profoundly impact their operations and services. AI has

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the advantages of enhancing **information processing and search**, helping information professionals find and provide specific information more quickly. With the application of AI, libraries will become more streamlined, convenient, and efficient in their operations and service delivery. Emerging technologies such as AI, the internet, cloud computing, and data mining hold great advantages for innovation and change in library services. Artificial intelligence (AI) is playing an increasingly important role in libraries and the information profession, revolutionizing the way these organizations operate and deliver services. As intelligent information technologies are integrated into all aspects of human activity, the applications and advantages of AI continue to grow rapidly. **In library and information science, AI facilitates research, data collection, transfer, storage, and access to information**. The combination of machine intelligence and machine learning is enabling rapid automated assessment and the generation of computer-based feedback and interventions. This paradigm shift is not limited to libraries but is transforming all sectors and industries. In the field of education, AI technologies are significantly changing teaching, learning, and research processes. Technologies like image recognition, face recognition, adaptive learning, and other AI-powered tools are bringing about several changes to improve teachers' work and students' learning experiences. AI's application extends to automated assessment of practical skills and providing appropriate feedback to individuals. For libraries, AI offers cutting-edge technologies to take advantage of, such as **metadata creation, translation search, and search integration**. It will revolutionize the way libraries operate, impacting knowledge processing and search methods. Information professionals can leverage AI to improve services, making it easier and faster for users to find and use specific information. AI will streamline and make libraries more efficient in their operations and service delivery. It will greatly impact areas like **search and resource discovery**, allowing for a more convenient and efficient navigation of libraries. Emerging technologies like AI, cloud computing, data mining, and smart technologies hold great advantages for innovation in libraries, services, and ICT management. AI has found its place in libraries as a **platform for discussion, responding to queries on library websites, providing alerts on overdue requests, and answering simple information requests**. Libraries have the opportunity to leverage AI to transform their operations and better serve their users. The integration of AI into the library and information profession is bringing about significant advantages, transformations, and developments. AI's advantages for revolutionizing libraries are evident in its impact on **knowledge processing, search methods, and efficient service delivery**. Libraries have the chance to embrace and harness these exciting new technologies to improve their services and enhance user experiences.

Artificial Intelligence Tools Applicable in Information Retrieval

AI tools are being increasingly used in information projects to improve data retrieval and analysis. **Natural language processing** (NLP) search engines, like Google, incorporate AI algorithms to understand and process natural language queries. By using techniques like semantic analysis, these search engines can provide more relevant and accurate search results. **Text classification tools** are another example of AI applications in information projects. These tools use AI algorithms to automatically categorize text documents based on predefined criteria, making it easier to organize and retrieve information. Additionally, **sentiment analysis tools** can determine the emotional tone of a text, which can be useful in understanding public opinion or sentiment toward a particular topic. Overall, AI tools are enhancing information projects by enabling more efficient and effective data retrieval and analysis. **Robots** are programmable machines that can perform automated tasks using AI technology. They improve the efficiency of

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library operations **by retrieving books or assisting in information retrieval for users. Big data** refers to the large volume, speed, and diversity of datasets used by AI to discover **patterns and relationships**. Data mining is an analytical tool used by AI to extract relevant information from datasets, helping users find new sources of information and support their research. **Chatbots** are AI software that engages in dialogue with library users, answering questions and providing personalized feedback. They can assist with research and navigate library resources. Chatbots differ from robots as they communicate verbally or via text, while robots use facial expressions, gestures, and speech. **Machine learning** is a subset of AI that automatically adapts to its environment with minimal human intervention and can be categorized as supervised, unsupervised, or deep learning. Deep learning involves complex neurobehavioral processes. Robots, powered by AI, automate functions in libraries and aid in information retrieval. Big data and data mining techniques enable the integration of library resources and facilitate precise research. Chatbots offer personalized assistance to library users and enhance efficiency. Machine learning encompasses various learning systems that adapt to their surroundings. These technologies collectively advance the capabilities of libraries and support users in finding relevant information.

Expediency of AI in Libraries and Information Centers

Artificial intelligence (AI) has the potential to revolutionize libraries by automating repetitive tasks, saving time and resources, and increasing productivity. By analyzing large data sets faster, AI relieves staff from performing tedious tasks, allowing them to focus on more meaningful work. Personalization of content and recommendations for library users can enhance customer satisfaction. AI-powered virtual agents also offer 24/7 availability, making information easily accessible and usable. Moreover, AI promotes collaboration and information sharing by connecting users with similar research interests, encouraging interdisciplinary cooperation, and fostering a sense of community. Additionally, AI can improve operational efficiency, enhance library services, and reduce operating costs, ensuring the sustainability of libraries. AI-powered virtual assistants and chatbots can offer direct assistance to users, answering their queries and guiding them toward relevant resources. Overall, AI holds the potential to transform libraries and enhance their efficiency in serving users.

Hindrances to the Successful Adoption of AI in Academic Libraries in Nigeria

Despite the possibilities of AI, its realization in libraries in developing countries, specifically Nigerian academic libraries, faces several hindrances. Among the hindrances are the inadequate ICT skills and technical expertise of librarians, which prevents effective application and use of AI technologies, inadequate financial support for libraries, backwardness in content digitization, fear of librarians losing the job, privacy and ethical issues, bad maintenance culture, irregular power supply, lack of essential infrastructure and technology, poor internet connectivity, and resistance to change among librarians are noticeable hindrances. Encouraging hands-on training and retraining of librarians, addressing financial constraints, improving content digitization efforts, ensuring data and information protection, enhancing maintenance culture, providing alternative energy sources, developing infrastructure and technology, and improving network connectivity are necessary to overcome these hindrances.

Conclusion

The development and deployment of smart technologies, particularly artificial intelligence (AI), are transforming libraries worldwide and bringing about significant changes in how they operate. Nigerian libraries can greatly benefit from AI, as it has the potential to improve the efficiency, effectiveness, and accessibility of resources. However, some hindrances need to be addressed as enumerated above. Addressing these issues will allow libraries to harness the prospects of AI and other new technologies, enabling them to deliver high-quality services and assist researchers in discovering and synthesizing information. Therefore, to successfully apply AI, academic libraries in Nigeria should actively train and retrain librarians, develop clear guidelines and policies for responsible use of AI, and adopt innovative technologies to meet the evolving information needs of users in the dynamic ICT environment.

Recommendations

To meet the information needs of today's dynamic ICT users in a rapidly changing library environment, academic libraries in Nigeria and other developing countries must embrace innovative, intelligent, and cutting-edge technologies. Alongside adopting these technologies, clear guidelines and policies need to be developed to ensure responsible and ethical use of AI in libraries. This is crucial to maintain trust and protect user privacy. By improving the quality of teaching, learning, and research in academia, AI can ultimately contribute to the overall development of the education sector in Nigeria.

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Можливості та очевидні наслідки впровадження штучного інтелекту (ШІ) в академічних бібліотеках Нігерії

Мета. У цій статті обговорюються можливості та наслідки застосування штучного інтелекту (ШІ) в академічних бібліотеках Нігерії. Дослідження підкреслює важливість використання бібліотеками нових технологій для покращення своєї діяльності та послуг, особливо в країнах, що розвиваються, таких як Нігерія. **Методика.** У дослідженні було проведено огляд літератури для вивчення можливостей штучного інтелекту в бібліотеках та його впливу на академічні бібліотеки. **Результати.** Були визначені різні інструменти ШІ, такі як розпізнавання природної мови, робототехніка, великі дані та машинне навчання. ШІ може революціонізувати бібліотечні послуги, покращити якість інформації, підвищити продуктивність і надати віртуальну допомогу. Однак на шляху впровадження ШІ в академічних бібліотеках Нігерії існують певні труднощі, зокрема висока вартість, опір змінам, погане підключення до мережі, конфіденційність та етичні наслідки, а також брак сприятливих культур. Щоб повною мірою використовувати переваги штучного інтелекту, бібліотеки повинні розробляти плани та політику, навчати бібліотекарів необхідним навичкам і розв'язувати проблеми, пов'язані з впровадженням штучного інтелекту. **Висновки**. ШІ має великі переваги для покращення бібліотечних послуг у Нігерії, але потрібне ретельне планування та підготовка.

Keywords: штучний інтелект, академічні бібліотеки в Нігерії