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Artificial Intelligence (AI) In Service Delivery to Academic Library by Librarians in Nigeria

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ABSTRACT: *This research looks at how librarians in Nigeria use Artificial Intelligence (AI) to provide services to academic libraries. This study addressed a problem that many librarians face in Nigeria, such as technical knowledge of AI, funding to purchase technology, and lack of government backing for libraries, among other things. The concept of Artificial Intelligence services delivery to academic library users and librarians in Nigerians, as a result of their application to the library's reference unit, readers' service unit, cataloguing and classification unit, and serial control unit, through some of its branches such as expert systems, opportunities for libraries, natural language processing, neural networks, and robotics. Some academic institutions have already accepted the use of artificial intelligence to handle some daily library routines, according to the report. The study goes on to discuss some of the obstacles that its application to university libraries faces, as well as possible solutions.*

KEYWORDS: artificial intelligence, academic libraries, robotics, challenges, services, and librarians

INTRODUCTION

Libraries have evolved tremendously in the years since computer access became widely available, and the rate of change has accelerated. Libraries have adopted, and in some cases facilitated, new technology and procedures that have improved their ability to fulfill their basic mission: providing customers with access to as much material as possible for the acquisition of knowledge and enjoyment reading. The objective has not changed, but the means of doing it has. Due to innovation, other means of accessing the written word, which was formerly the practically exclusive domain of libraries, are becoming available, raising the question of whether libraries will be needed in the future. Will libraries continue to be a vital and important

part of their communities in the face of technological developments and other challenges? The focus of this research is to find an answer to these questions.

According to a survey of the literature, libraries are still important in American and African society. Given the introduction of a variety of digital alternatives to traditional library content, which comprised of media published on paper, extensive research has been conducted to determine how relevant libraries are (American Library Association, 2010).

The researchers believe that while technological advancements of any type cannot render libraries obsolete, they are here to assist the goal and vision of libraries, which includes research, teaching, and community service to society. As a result, the current technology known as "Artificial Intelligence (AI)" is beneficial to library services. Because of the technology's importance to library routine and operations, it is librarians' responsibility to coin, embrace, and use it. However, many librarians in Nigeria face technical knowledge of AI, lack of funding to purchase technology, and lack of government backing for libraries, among other difficulties that this article seeks to address. The answers to these questions will contribute to the body of knowledge/literature. As a result, the study's main focus will be on the notion of AI in relation to academic library services.

Artificial Intelligence (AI) as a concept

The term "Artificial Intelligence" was coined from the combination of two independent terms, and it has dominated the academic world of technological growth over the years. Artificial is defined as "anything manufactured out of imitation, something not natural, lacking spontaneity, assumed and not sincere," according to the online edition of the British Dictionary (2012). The Webster's New World Dictionary goes on to define artificial as something created by humans and not naturally occurring. In other terms, it refers to something that is artificial or arbitrary and does not arise from natural or essential reasons. According to Merriam-Webster Online Dictionary (2022), intelligence is "the ability to learn, understand, or deal with new or difficult situations through the skilled application of reason, the ability to apply knowledge to manipulate one's environment, or the ability to think abstractly as measured by objective criteria (as tests)". It is not a single mental process, but a combination of many mental processes directed toward effective adaptation to the environment, according to the Encyclopedia Britannica (2006). Intelligence is defined as the ability to adapt effectively to the environment, either by making a change in oneself or by changing the environment or finding a new one. It is not a single mental process, but a combination of many mental processes directed towards effective adaptation to the environment.

Although the notion has been used by libraries and librarians in the Western world for decades, it is relatively new to the Nigerian academic library system. Artificial intelligence and its relation to library services have been defined and discussed by a variety of academic experts from across the world. Having a single entity definition for artificial intelligence will be difficult and time-consuming, as various authors have stated that its use implies a technological transition. However, for the purposes of this work, we will accept a few definitions from other authors. Artificial intelligence (AI) is defined by Frankenfield (2021) as the simulation of

human intelligence in computers that are trained to think and act like humans. The phrase can also refer to any machine that demonstrates human-like characteristics like learning and problem-solving. Artificial intelligence, as described by Kok, et al. (2018), is a branch of computer science concerned with the creation of computers capable of human-like mental processes such as learning, reasoning, and self-correction. The article goes on to say that the machine's notion may be refined to include some skills generally associated with human intelligence, such as learning, adapting, and self-correction. Artificial intelligence, according to Merriam-Webster (2019), is a branch of computer science that works with providing machines the ability to appear to have natural human intelligence. Expert systems, fuzzy logic, artificial neural networks, evolution algorithms, case base reasoning, image processing, natural language processing, speech recognition, and robotics are some of the areas that Asemi and Asemi (2018) define artificial intelligence as a branch of computer science that focuses on creating machines that can engage in behaviors that humans consider intelligent. Artificial intelligence, according to Heath (2018), is described as the technology that enables robots to plan, learn, reason, solve problems, move, and to some extent be creative.

Artificial Intelligence's goal is to create computers that can think, see, hear, walk, communicate, and feel, and the beauty of this technology is that it can recognize patterns at a size and pace that humans cannot. Artificial intelligence can be defined as a replica knowledge obtained through the use of computer peripherals and programmed to become actual and valuable to mankind due to its technical application and usage. It is a technology that has provided the globe a boost in terms of human knowledge progress and applicability across all disciplines.

Services and functions of an academic library

Academic libraries serve as a centre for teaching and research activities, enhancing and meeting the demands of its clients for continual academic and intellectual advancement. According to Chalukya (2015), academic libraries are created to meet the teaching and research needs of the institutions they serve, with the goal of maximizing the use of their information resources and services for the benefit of its users.

Academic libraries in Nigeria should not fall behind in terms of technology improvement in terms of discharging and performing the typical academic library routine. The academic library has continued to evolve from its traditional (analog) roles to digital and, more recently, artificial intelligence capabilities. It is critical to underline that, when daily library schedules change, so do the responsibilities of academic library librarians in order to improve work performance and skill acquisition.

Academic libraries have always been tasked with providing direct service to individuals on an individual basis, independent of the type of material or the purpose for which it would be used by library users. Academic library operations and services were impacted by the period of digital libraries and librarians, as services were relocated to the virtual world of the Internet. This technology allows library users to send questions to library administration at any time and from anywhere in the world, allowing patrons to access resources outside of the physical library

building, according to Chandwani (2018). This paradigm shift in artificial intelligence technology has placed the library in a technologically advanced position, and unless the library begins to explore the benefits of artificial intelligence and apply them to her daily routine activities in service delivery, they may face obsolescence in this era. The introduction of Artificial Intelligence (AI) into academic library services has boosted the transmission of information services even further.

Libraries will need to prepare their own personnel and become centers of ongoing education for their communities as machines begin to take over an increasing share of human "thinking" job. Academic and public libraries have long positioned themselves as centers for lifelong learning, and this positioning represents an opportunity to capitalize on. The aforementioned truckers, who will inevitably be replaced by self-driving trucks, represent a community that will require new skills and information, which libraries can assist in providing. In most communities, libraries continue to enjoy a high level of trust and affection. Perhaps it's because of the noble nature of our goal, or because libraries are places of discovery, or because we've always prided ourselves on excellent customer service; users are regularly treated with empathy, understanding, and kindness.

Such sentient features may be imitated by machines, but they remain the domain of humans for the time being. Because the public trusts libraries, we are in a unique position to help those who distrust the government, the media, and scholarly experts. Let us remove the myth that libraries' opportunity is solely based on emphasizing the human qualities that distinguish us from technology. We need to comprehend algorithms and how they enable machines to function. "It appears that the reasonable approach is to educate humans differently so that they are prepared to work alongside robots or undertake jobs that machines cannot" (Miller, 2017). To understand the significance of big data and how it can be manipulated, visualized, and analyzed, we need to develop quantitative and analytical abilities.

Academic Libraries' Adoption of Artificial Intelligence for Service Delivery

Using machine learning for library applications can help libraries stay relevant in the future, take on new responsibilities and services, and avoid becoming outdated. However, overcoming the challenges of AI adoption is an essential stage in the library's journey. Artificial intelligence is a wide idea that can be used to every aspect of academic libraries to transform them into smart libraries. The incorporation of Artificial Intelligence (AI) into academic institutions for the delivery of services has opened doors for serious concerns affecting traditional library routine services to be addressed in a timely manner. Shelf space for books and other information materials, cataloguing and categorization, serials functions, collection development, and procurement of resource materials, among other things, shall be addressed urgently and promptly. According to Tella (2020), academic libraries must reposition themselves to take use of the potentials of artificial intelligence by improving the quality of library services in this information age. This use in academic libraries will aid in the delivery of greater information services as well as better search, which will thrill both library staff and users due to the faster access to information. Artificial Intelligence (AI) in library services delivery has aided in the improvement of many librarians' job responsibilities, including

cataloging, indexing, information retrieval, reference, and other tasks. It can be used in a variety of applications, including speech recognition, machine translation, and library robots. According to Tunde et al. (2022), the University of Lagos is currently the only institution in Nigeria that has adopted the use of artificial intelligence in some library services and operations, and library professional awareness of the use of artificial intelligence in library services and operations is still low. However, for the purposes of this article, artificial intelligence activities will be limited to reference services, cataloguing & classification services, circulation services, and collection development services provided by academic libraries. Artificial intelligence's usefulness in academic libraries is critical, based on its basic characteristics. The academic library is the institution's image creator, and incorporating technology into its service delivery will enhance and create a new driving force that will give more efficient, effective, and high-quality services to library patrons.

The academic library's reference services delivery unit uses expert systems.

An expert system is a computer program that simulates the decision-making abilities of a human expert; it mimics human decision-making intelligence. It is a knowledge-based system that applies knowledge about its application domain and employs an inference (reason) technique to solve problems that would otherwise necessitate human skill or competence. They're made to reason through large quantities of knowledge to solve complex challenges. An expert system, according to Shrivastava (2018), is a computer program that aims to emulate human experts through its abilities to provide counsel, teach, and execute intelligent tasks. The implementation of an expert system to the academic library's reference service unit will go a long way toward improving the efficiency of the routine reference librarian's duty. The addition of artificial intelligence to the reference unit, on the other hand, will assist library users in learning how to use the library's information resource materials, as well as assisting patrons in locating information resource materials on the shelves and further guiding library users on the types of information resource materials available. The reference unit's artificial intelligence instructs users on how to use online information resource resources. This is due to the fact that building software necessitates an expert knowledge base in a specific domain. Expert systems are known for being extremely responsive, dependable, understandable, and capable of high execution. The beauty of expert systems is that they draw on a knowledge base in a specific subject to apply that information to the realities of the situation at hand. As a result, when applied to an academic library reference unit, the expertise-based information will deliver an exceptional and efficient result for all library customers. When an expert system is used in the library's reference service unit, it may execute jobs considerably faster than a human expert. Successful systems have a low mistake rate, often significantly lower than human error rates for the same activity. It may also make it easier to make consistent suggestions.

Natural Language Processing (NLP) in the Academic Library's Collection Development Unit

Natural Language Processing is another area where artificial intelligence technology could help the academic library gain traction. This technique allows a computer to understand the main linguistic concepts within a query or solution, with the goal of designing and building computers that can analyze, understand, and generate language in the way that humans do

(Kumar,2004). Natural Language Processing (NLP), according to Zulaikha (2020), is the study of extracting information from natural human language in order to communicate with robots and grow enterprises. Natural language processing, according to Poelmans (2020), is a type of artificial intelligence (AI) that allows computers to read, understand, and interpret human language. It aids computers in determining the importance of certain aspects of human language. Because of the vast volume of unstructured data, the lack of formal rules, and the lack of real-world context or intent, this is a very challenging task for computers. When applied to academic libraries, some of the methods employed in natural language processing that boost artificial intelligence include: Voice text messaging, spell checker, autocomplete, spam filters NLP attempts to develop and create a computer that analyzes, interprets, and generates the language that a person uses, understands, and generates, according to Vijay and Sheshadri (2019). It has different elements such as speech synthesis, machine translation, linguistic methods, information recovery, information extraction, and speech recognition. Artificial intelligence researchers hope to be able to converse with machines in conversational human languages and have them comprehend us. According to Omame and Alex-Nmecha (2020), NLP may be utilized in libraries to create intelligent expert information retrieval systems that users can engage with directly using natural language. The computer receives natural language as input, analyzes and processes it, and then responds with the information required. This technology allows the academic library's collection development section to be extremely precise in reacting to user needs in the library without the need for human intervention. It is the academic library's collection development section that sources for users' particular needs and makes these relevant information materials readily available through suitable selection tools and acquisition methods. It also reviews the library collections on a regular basis through thorough weeding. The use of natural language processing technologies in academic libraries will significantly improve service delivery. Natural language systems are currently used mostly as a user interface for expert and database systems.

Neural Networks at the Academic Library's Cataloguing and Classification Unit

These are computer systems based on the mesh-like network of interconnected processing components known as neurons in the human brain. The human brain is significantly more complicated than neural networks (estimated to have more than 100 billion neuron brain cells). However, similar to the brain, such networks can digest a large amount of data at once and may learn to discover patterns and programs to tackle related issues on their own. Neural networks, according to Mohaiminul, Guorong, and Shangzhu (2019), are a sort of artificial intelligence that tries to mimic the way the human brain operates. A neural network operates by constructing connections between processing elements and the computer equivalent of neurons, rather than utilizing a digital model in which all computations handle zeros and ones. It is a collection of interconnected processing units that can accept, process, and output a single output, with the goal of simulating the human brain's operation. The pattern of connections among the processing components and the weights of these connections are used to represent knowledge in a neural network. The neural network may be trained to recognize specific patterns and then

applied to other situations where the patterns can be discerned. This use of artificial intelligence to the academic library's cataloguing and classification unit will improve the unit's overall functions. Remember that cataloguing and classification of library information resource resources, while time-consuming, is at the heart of the librarianship profession.

To characterize information resources, cataloguing and classification give specifics such as author names, titles, and subject terms. It also uses cataloguing and classifying tools and schedules to assign information to a class in a classification system. Given the billions of neuron cells used manually to complete the task in this unit of librarianship, the use of a neuron network to do the task will be extremely efficient. According to Doszkocs (1990), incorporating neural networks and other artificial intelligence technologies into academic libraries will undoubtedly provide a massive solution to major academic library challenges, such as the ability to self-organize and automatically restructure the database, support natural language interfaces, resolve semantic ambiguities and complexities in queries, and perform closest (partial) matching. The researcher went on to say that it provides ranked output of relevant items, organizes the database according to user preferences, accepts relevance and other user feedback, learns document, term, and query distribution patterns, exploits implicit and explicit associations in the database, copes with the combinatorial information explosion, provides "intelligently synthesized" output (answers, summaries), discovers and suggests new relationships and hypotheses.

Robotics in the Academic Library's Readers Services Unit

According to Wikipedia (2014), robotics is a subfield of Artificial Intelligence that deals with perceptual and motor tasks. It is defined as a mechanical device that uses artificial intelligence techniques to perform automation tasks under direct human supervision, a pre-defined program, or a set of general guidelines. The basic disciplines of robotics are engineering and physiology. Robot robots with computer intelligence, computer control, and human-like physical capabilities are created using this technology. Given the wide range of services provided by academic libraries around the world, the incorporation of robotic services into the circulation unit of an academic library has become essential. Robots are multi-purpose manipulators that are automatically controlled, reprogrammable, and programmable in three or more axes. They can be fixed in place or transportable for use in automation applications. Libraries continue to buy enormous numbers of printed documents as they expand their digital library services and resources.

Many libraries, particularly academic research libraries, are experiencing severe space restrictions as a result of the demand to provide both electronic and print-based resources and services. According to Vysakh and Rajendra (2020), they have begun to use robots instead of humans in a variety of procedures, particularly those that are hazardous and time-consuming. For instance, a robot at the PESIST central library assists in filing, classifying, and replacing volumes on the shelf, and libraries with large collections are now adopting robots for inventory purposes (Manoj, 2016). The use of robots to perform this duty improves the efficiency of the library's operations. The librarian uses the time that the robots take up on other tasks, rather than wasting it travelling from one location in the library to another. Another robot named

'Bobbie' from the same library delivers goods such as newspapers, periodicals, and pamphlets, as well as greeting and directing visitors and pupils to various locations. The robot has also been trained to respond to students' frequently asked questions (FAQs) (Tay, 2014). Talking robots can be positioned throughout the library to assist and advise users, and the integration of robotics with other artificial intelligence technologies, such as a drone controlled by a robot, can ensure that the library is always under observation.

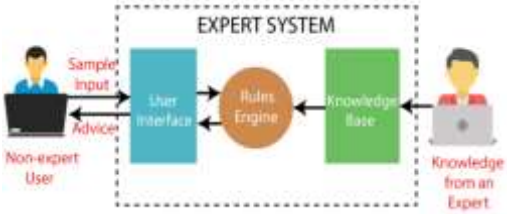

Fig. 1: Image of Expert System

Fig. 2: Image of Natural Language Processing

Artificial Intelligence Challenges in Nigerian Academic Libraries

According to the numerous advantages of using artificial intelligence applications. When it comes to AI, Nigerian academic libraries are still lagging behind. Academic libraries continue to operate in the same manner as before. There are various AI difficulties in the Nigerian library system. The following are a few of them:

1. Inability to use current approaches due to a lack of infrastructure. Technical issues are the major impediments that Nigerian academic libraries confront in their ability to construct smart systems, according to the individuals in the sample. The library must have up-to-date technology, such as computers and other devices.

2. Because providers perform the maintenance, repair, and development of these systems, there is a scarcity of suppliers of artificial intelligence approaches in the field of libraries locally, as well as a constant need to update programs and applications. In the Western world, Naseej's organization is regarded as one of the most important suppliers of artificial intelligence tools for libraries.

3. A scarcity of artificial intelligence professionals with a focus on libraries, as well as the difficulty of dealing with electronic system technical issues. Many Nigerian computer science (artificial intelligence) experts who have graduated from universities or been sent abroad can develop the systems used by academic libraries, but the lack of plans to develop libraries, including the goal of contracting with these experts and benefiting from their expertise, is regarded as the fundamental problem.

4. A shortage of human librarians who have been trained in artificial intelligence technologies.

5. For library personnel, the concept of artificial intelligence is unclear.

6. Insufficient funds to purchase programs and applications. The deans and agents of Saudi academic libraries have agreed that the most significant barriers to the deployment of artificial intelligence are a lack of financial support for development and modernization.

7. The beneficiaries' lack of technical familiarity with artificial intelligence technology, indicating a lack of content in the curriculum that train researchers and students to use digital databases.

8. A lack of supreme will on the part of decision-makers since staff and senior management must be educated on the value of artificial intelligence and its role in providing improved service.

9. Artificial intelligence applications in Nigerian academic libraries have the potential to eliminate human jobs. Because these computers can be programmed to reason and behave like real humans, they have the potential to do the work of real humans, resulting in additional job openings for librarians with academic credentials. According to Jasrotia (2018), because intelligent machines in libraries can read digitized resources, analyze them, and provide tailored insights, answers, and services faster than librarians, artificial intelligence can be a "threat" to librarians but not to the libraries' existence.

10. Another issue that may arise as a result of the use of artificial intelligence in Nigerian academic libraries is the lack of technical skills to operate the equipment. Artificial intelligence is a complex topic that is difficult to navigate for non-specialists, necessitating the use of professional skills and employees to operate these machines. Professional librarians to operate these machines may be difficult to come by.

11. A lack of proper financing is another important obstacle that could stymie the use of artificial intelligence in Nigerian university libraries. Most academic libraries' budgets have been shrinking year after year, forcing them to acquire only the information resource materials and systems that are within their financial reach.

12. Another issue that could stymie the use of artificial intelligence in Nigerian university libraries is that it can go wrong. When there are faults with the various program devices that

make them function effectively, such as Robotics, which is programmed to carry out particular information and responsibilities, the services delivery will continue to be on the reverse until the fault(s) are fixed. This was clearly stated when Ex Libris (2019) claimed that artificial intelligence systems could spread false information if the algorithms that power them become troublesome.

Another key obstacle that limits the use of artificial intelligence in Nigerian academic libraries is erratic power supply. In Nigeria, almost no academic institution has a continuous power supply, and this deficiency has hampered the installation of electrical appliances that would enhance academic activities and programs.

Alternatives to the aforementioned Challenges

How might artificial intelligence (AI) be utilized to help libraries tackle real-world issues? Here are a few examples of how AI applications can provide libraries with immediate, measurable value:

Solutions for Technical Issues

• Increase operational effectiveness

Process automation, efficient research data management, and digital asset management can help libraries detect and amplify operational efficiency by boosting service efficacy and lowering operating expenses (DAM). Machine learning can be used in the library's procedures and digital resources to improve collection analysis, visualization, and preservation while also lowering service delivery costs. Adopting sophisticated library services platforms (LSP) can aid in the development of initiatives that improve operational efficiency even more.

• Improve user experience and introduce new services to reach a broader audience.

Machine learning algorithms can tailor material from thousands of resources quickly, replacing the manual sorting of only a percentage of that data, by enhancing search engine results with chatbots and location-based services. Data on user touch points, previous interactions, and habits can also be used by AI systems to identify needs and create high-quality, engaging experiences for patrons. For more effective learning, this includes providing individualized, exact research recommendations and even aligning search results with the individual student's knowledge level.

• Assist librarians in achieving their new objectives

AI implementation can reduce human errors and inefficiencies by reducing manual daily routine search and reference activities to a minimum. This automation also frees up library workers to focus on higher-value, more sophisticated duties like supporting lecturers with reading lists, teaching students how to enhance their research efforts, and building library collections, among other things.

• Ensure that libraries have a strong presence in the new scholarly information landscape.

By assisting in the discovery of linkages to enormous data sets that would otherwise go unnoticed, AI technology can help academic research become more cross-disciplinary. Libraries can also help establish a smooth flow of data and research across industries and disciplines by collaborating with open publication groups and implementing research tools that work with other institutions. Their collections become easier to find, explore, and analyze, resulting in a vast, high-quality worldwide network of resources.

Solutions from the standpoint of Nigeria

Library staff should be subjected to ongoing training and retraining programs in the application of artificial intelligence. They should attend seminars (both local and international), workshops, and conferences where experts in the field of artificial intelligence will interact with them one-on-one, and they will be exposed to artificial intelligence technology in a practical setting. Nigerian higher education libraries should focus their efforts on determining how artificial intelligence may be used to give services to library customers, resulting in high levels of satisfaction and efficiency.

The library management of government and higher education institutions should collaborate on the best ways to introduce and employ current technology like artificial intelligence in providing library services to potential library customers. In order to acquire new technology such as artificial intelligence in Nigerian academic libraries, standard procedures that will stand the test of time from one administration to the next should be put in place. This policy will help to enhance and soften the process of obtaining library equipment in the future.

Professional librarians and higher education library management authorities should collaborate to determine the type of artificial intelligence technology that will best suit the dissemination of information services in libraries for ease of service delivery and library material purchase.

CONCLUSION

Artificial intelligence (AI) in service delivery to academic libraries by Nigerian librarians is discussed in this research. In the western world and several African countries, a series of artificial intelligence success stories have been achieved in the supply of information services. Nigeria, in particular, continues to struggle with automation and digital information resource conventions, to say nothing of artificial intelligence. Despite the shortage of resources in many university libraries, the issues must be addressed so that policymakers can focus on them. If policymakers accept the ideas discussed in this study, AI will be widely implemented in Nigerian university libraries very soon. Artificial Intelligence technology has not only improved human existence in terms of service delivery, but it has also allowed academic libraries at higher educational institutions to expand their scope of activities and expand their horizons of service distribution with ease and precision. Expert systems, natural language processing, neural networks, and other technologies have also turned the analog everyday library routine services into a more super automated information dissemination center. Finally,

the increasing relevance of Artificial Intelligence, as demonstrated in this research, indicates that librarians who adopt this recommended technology will have their lives and functions considerably better in the near future.

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