ENTRENCHING ARTIFICIAL INTELLIGENCE IN THE OPERATIONS OF ACADEMIC LIBRARIES IN NIGERIA

Rev. Orya Bogo
College Library,
College of Education Katsina-Ala.
E-mail. oryabogo@gmail.com
08068553846

Abstract

The adoption of Artificial Intelligence can improve library services and provide access to accurate information that can drive growth and development in this information age. AI technologies are now being employed in libraries to enable organic reader-library interaction. Due to the increasing presence of artificial intelligence (AI) in developed countries and Nigeria in particular, this paper makes an appraisal of the role of artificial intelligence in academic library service delivery in academic libraries in Nigeria. The research is qualitative and relied on secondary sources. The paper identified the advantages of adopting artificial intelligence in academic libraries to include, ease of use, endless functionality, and the ability to perform complex work, among others, and the challenges faced by library management towards adopting artificial intelligence, which include financial uncertainty, job loss, and technological defects, among others. The paper concluded that adoption of AI in academic libraries sets a new level of efficient and effective library service delivery, but adoption in developing countries such as Nigeria is low due to some identified challenges. The paper recommended that government and library management should come together to suggest the way forward for academic libraries in terms of meeting the latest standard for the use of AI in libraries; library staff need to undergo training and retraining in the use of artificial intelligence in providing library services, among other things.

Keywords: artificial intelligence, academic libraries, library services,

Introduction

Artificial intelligence (AI) technologies are becoming globally recognized as indispensable tools for improving organizational efficiency and productivity. Therefore, suffice it to say that AI technologies have strongly influenced the world of work in the 21st century. In the library setting, the adoption of AI can improve library services and provide access to accurate information that can drive growth and development in this information age. Artificial intelligence technologies are now being employed in libraries to enable organic reader-library interaction. Through this, readers interact on the same platform and track and acquire users' personal needs and information so that users can access accurate information and human services at a low cost and rationally use library resources. Tella (2020) emphasized that libraries in developed countries have accepted and used AI technologies in almost all spheres of life, while those in developing countries are still struggling to find their feet. In higher education institutions, the four main infrastructures are laboratories, equipment, teachers/classrooms, and libraries that contain rich and balanced information resources that can support teaching, learning, and research work (Tiemo & Ateboh, 2016).

Libraries are the nerve center of the educational institution and the place where information is provided to serve all the beneficiaries, regardless of their age, political and moral backgrounds, religion, gender, etc. The transition of media materials from book collections to audio tape collections, video collections, databases, digitization of information materials, library automation, and now the adoption of artificial intelligence in library operations (Vijayakumar & Vijan, 2011) This means that one of the motives for adopting artificial intelligence technologies in academic libraries is to meet the needs of users. This paper makes assess the role of artificial intelligence in academic library service delivery in academic libraries in Nigeria.

Statement of Problem

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. 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. 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 AI can play a positive role in library services in higher institutions in Nigeria? What are the areas that AI technology has impacted positively on library services in higher institutions in Nigeria? What are the challenges of using AI technology in Library Services in higher institutions in Nigeria? The focus of this research is to find an answer to these questions.

Aim and Objectives

The aim of the study is to make an appraisal of the role of artificial intelligence in academic library service delivery in academic libraries in Nigeria. Specifically, the objectives of the study are to:

i. examine the concepts of Artificial Intelligence and Library Services.

ii. assess the role Artificial Intelligence in Library Services in higher institutions in Nigeria.

iii. identify the areas in which AI has impacted on Library Services

iv. and suggest ways of enhancing the use of AI in Library Services in higher institutions in Nigeria.

Significance

This paper is significant theoretically and practically. Theoretically, it will add to the existing literature in this area of knowledge. While practically, will is useful to policy makers, stakeholders in the educational

sector, librarians, lecturers and students. The findings of the paper will help in the implementation AI in academic libraries in Nigeria. This makes the study useful to many.

The Concept of Academic Library Services

Academic libraries are those libraries that are established in tertiary institutions to serve two complementary purposes which are teaching and learning. Academic libraries according to Edom (2012) are those libraries established in institutions of higher learning such as universities, polytechnics, monotechnics, colleges of education and other similar institutions to support and enhance the tripartite functions and the full realization of the educational goals of the parent institutions. Nwosu (2000) described academic libraries as the singular and most important resource in the pursuit of the goals and objectives of institution of higher learning. Edom holds that academic libraries are very important since all academic activities revolve around the library. Some school of thought have unequivocally said that "no library, no institution". This expresses the importance and indispensability of academic libraries in the realization of higher institution educational goals. Academic strength of any tertiary institution is dependent on the strength of its library. No wonder accreditation teams of any higher institutions emphasizes majorly on the adequacy of the library.

The nature and location of academic libraries make them an essential arm of the parent institution, conferring on them the responsibility of winning the goal of the institution. Okorie (2016) stated that academic library service applies to how patrons are enabled to use the library and all that it provides. Academic libraries offer a wide variety of useful information sources, expertise, and technologies. They also provide support in accessing and using these resources to satisfactory end provided through various library services. The author went on to state that the satisfaction of library users is a function of three main sources - the information products received; the quality of information system and library services provided. Access to full library services is partly determined by one's status in the parent institution that established the library and wholly by registration status in the library.

Academic library services are categorized into two broad terms which are; conventional library services, and services for promoting library use. The conventional or traditional services include; circulation; reprography and inter-library loan while the services for promoting library use are as follow; Initiation/orientation service, reference service, current awareness service/selective dissemination of information service, information brokerage, community information service, ICT related services, internet services, new book display, press clipping service etc. Academic libraries have various statutory functions and services they provide to their users that have relevance to her mission and to the users (Nwosu, 2000). These functions according to the author are:

i. To provide information resources such as books, reference books and serial publications.
ii. Organization of materials
iii. Provision of reference services
iv. Provision of loan services,
v. Cooperation with other libraries and
vi. To provide environment conducive for study. (pp. 28-31)

Types of Library Service in Academic Libraries

Library orientation/user education: According to Amen (2004), users' education aims to provide knowledge and skills necessary for the library user to find his way around the library and also make effective use of the library sources and services. Okorie (2016) affirmed that users education is concerned with the instruction and training given to the library user by the librarian so that he/she will be able to make maximum use of the library and its information sources. The author stressed further that user education has to do with orienting, informing and instructing the user on how to use both the library and information. It is concerned with both library training and information skills training and it covers all the activities involved in teaching users how to make the best possible use of library resources, services and facilities which includes formal and informal instruction delivered by a librarian or other library staff.

Library orientation is a quick guided tour of the library with the aim of showing the students the location of the library, information resources, and facilities that exist in the library (Edom, 2012). Sometimes, the students may be given leaflets and fact sheet containing the library rules and regulations while Uchendu and Ezebuiro (2016), stated that library orientation programme involves an introduction of the students to the library and its services through a guided library tour which may last between a few hours or a few days. This type of orientation is not in-depth enough to cover the use of library comprehensively.

Exhibition and Display: According to Nwalo (2003) and Amah (2004), exhibition and displays are important to advertise the services and resources of a library. A display draws the attention of the library users to the services rendered by the library. It publicized the services of the library through illustrative materials on display stands or display boards. Exhibition is generally to stimulate readers' interest on a particular area of interest. Exhibition and display are often topical focusing on a particular topic. They are mounted to capture users' interest and motivate them to explore some library resources. To Olanlokun and Zaid (2006), exhibition is what is displayed or held forth for the public which could be a display of works of arts, skills, pictures, books and other materials. Libraries often hold exhibitions to display new materials stocked by the library. The displays are to inform the patrons about their availability in the library. For example exhibition can be mounted for the Ebola virus disease, general election in Nigeria and so on.

In line with library exhibition and display, Young (2002) asserted that library exhibitions can provide some answers to some questions often asked by library staff and users. The author reports how exhibitions of Treasure brought attention to libraries, the Treasure Exhibitions in Australia attracted over 115,000 visitors; this states the relevance of exhibition in libraries. Bamijoko, Oguntayo and Idada (2011) maintained that during the occasion of library exhibitions, prices of books are reduced to enhance visitors' patronage. Both the students, members of staff and even the library will have the opportunity of buying books at cheaper rate. At this time, the library also evaluates her services hence a notebook is made available for

people to comment on the library's services. After which the library uses the comment to assess and improve on their services.

The Concept of Artificial Intelligence

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. 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 concept 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. 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.

The goal AI 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.

Artificial intelligence is a vast and complex field of study, and it can be difficult for nonprofessionals to understand. However, its ultimate goal is to create computer systems that rival human intelligence, and this clearly has major implications for libraries (Asemi & Asemi, 2018). There are various applications of artificial intelligence in the library system, such as descriptive cataloging, technical services, and collection development; subject indexing; reference services; database search; and delivery of documents. Some papers deal with the basic design issues of knowledge representation and natural language processing. Several authors have previously provided in-depth overviews of AI technologies. Sivrajah et al. (2017) note that the use of AI in academic libraries allows for better analysis of data sets, especially large data sets used for analysis across multiple data sets. It also helps get rid of repetitive and boring tasks. This means that the application of AI to library operations helps libraries develop capabilities that can exceed those of the human mind. Libraries, including university libraries in developing countries such as Nigeria, fail to adopt digital

technologies and also show resistance to change in the use of technologies in different library operations (Wheatley & Hervieux, 2019).

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 have 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 are 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

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 programme, 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

Advantages of Adopting AI for Effective Library Services in Academic Libraries

Artificial intelligence (AI) has made it possible to provide solutions to pressing challenges facing libraries, such as bookshelves, other library materials, cataloging, and the acquisition of library materials, among others. Thus, library services can be rendered more effective and efficient ways to improve user satisfaction. Therefore, library users can access accurate and timely information quickly. Fernandez (2016) indicated that the use of AI in academic libraries will help in analyzing big data, creating metadata, and improving search translation. This means that the use of artificial intelligence in academic libraries will make library materials more accessible and available and allow staff to answer user inquiries about the use of artificial intelligence. Tella (2020) stressed the need for academic libraries to change their position to take advantage of the relative potential of artificial intelligence by improving the quality of library services in this information age. Talley (2016) also emphasized the need for university librarians to adopt AI technologies to provide better services to researchers and other library users. Grant and Camp (2018) note that many academic libraries, particularly in developed countries, have adopted AI in various library operations, such as distribution and reference services. According to Sagarjit and others (2001), the adoption and application of artificial intelligence have boosted user engagement in many industrialized countries throughout the world. Timely information can only be accessed in situations where AI is used to guide and support while at the same time being user-

friendly, particularly in searching for information. For example, friendly AI technology will help users search for information easily, retrieve information across different combinations, and assist with users' queries.

Asefeh and Asemi (2018), for example, identify many ways in which AI technology might be utilized to improve library services, such as distribution services, bookshelves, and the categorization of library resources. AI technology can also be used to map metadata and assist with non-text searches. Fernandez (2016) points out potential opportunities for AI in library operations, particularly in big data analysis, metadata generation, translation of search items, and integration of search items across contents. Divayana et al. (2015) recognized certain benefits of AI in library operations, including the potential to fulfill library chores more effectively. Using AI processes, libraries can perform tasks very quickly, compared to what humans do. Artificial intelligence can be used to find previously unknown concepts, such as outer space, and to reduce human errors in library operations. Liu (2011) argued that academic libraries can develop library AI by using expert systems in the reference section to recommend library materials to users to satisfy their inquiries. Mughali (2015) also identified some advantages of AI, including

- It can perform cumbersome and complex work that humans may or may not be able to do.
- completing tasks faster than a human being can.
- the discovery of unexplored things, that is, outer space;
- fewer errors and defects;
- . It can help to easily access search jobs in any part of the world.
- The function is infinite.

Challenges of Adopting AI in Academic Libraries

Despite all the potential of AI in libraries, academic libraries in Nigeria have not yet embraced and implemented AI. Perhaps due to the low level of awareness and adoption of the importance of AI in libraries, research linking artificial intelligence (AI) and librarianship is still relatively low. While the use of AI is growing exponentially in other fields, this has not been the case in library and information science. The challenges facing

libraries today pose a significant threat to the traditional role of libraries. Libraries now struggle with operational inefficiencies, technological deficiencies, difficulty maintaining existing audiences and engaging new audiences, and an inability to demonstrate value and benefits to all stakeholders. Korinek and Stiglitz (2017) assert that advances in AI technologies can lead to job loss or job polarization. The adoption of AI can lead to a significant rise in inequality due to automation. The World Bank (2016) asserted that developing countries may be more reluctant to adopt AI because it will lead to a higher rate of job loss. The report also states that 69% of job losses will occur in India through the adoption of AI, 72% in Thailand, 77% in China, and 85% in Ethiopia. All of these studies indicate that AI can lead to job losses and potentially job destruction in a significant way. The International Labor Organization (2018) also confirmed that with the current trend of technological change based on the adoption of AI in various organizations, including libraries, the adoption of AI has created widespread fears of job loss and a significant rise in inequality. 9 Other obstacles to AI deployment in academic libraries include:

- Financial uncertainty: When government funds shrink and political or economic changes take place, cultural institutions are often the first to suffer cuts. In many ways, the struggle to obtain institutional or government funding is a lot like a chicken-and-egg problem. Libraries are expected to show value for money and showcase cost-effective practices, but they cannot do so without incorporating new technologies to upgrade their physical spaces, offer new services, and improve the user experience for patrons today, all of which require more funding (Tella, 2020). Consequently, today's libraries often find themselves in financial straits, unable to show value without additional funding.
- Merging skills gaps: information digitalization has had an impact on both library operations and systems. Today, the digital world is just as important as the physical realm, making it imperative for libraries to develop new skills to not only stay competent but also to better serve patrons in the digital age. These services require new competencies, such as higher levels of digital fluency, the ability to provide the most relevant resources at a much faster pace, and

support for hands on creative activities to maximize the learning experiences of the recipient.

- ❖ Competing with Existing Alternative Information Sources: According to a 2017 Horizon report, a survey found that 68% of college students start their research with Google and Wikipedia. These free providers of information, along with the emerging open access trend in academic publishing methods, are emboldening libraries to rethink their distribution of quality information in the context of retaining a significant presence in the new information world.
- ❖ Attracting new and varied audiences: In order to attract and engage new audiences, libraries must provide services that satisfy the expectations of a new generation of highly educated people. connected patrons. This involves rethinking the traditional physical space of a library, moving from a quiet space filled with bookshelves for reading and reflective writing to something completely different. To remain relevant, the library must become a vibrant space for collaboration and innovative activities, along with a quiet space for reflective study.

Conclusion

The adoption of artificial intelligence technology in academic libraries in Nigeria will set a new level of efficiency and effectiveness in providing library services. Accreditation also gives libraries the opportunity to provide improved and dynamic services to their beneficiaries. Artificial intelligence is used to direct and support the activities of the library and, at the same time, is easy to use, especially in searching for information. These are among the benefits derived from the adoption of AI in libraries. However, despite the benefits associated with the adoption of AI in libraries, some challenges, such as financial uncertainty, emerging skills gaps, job losses, a lack of adequate infrastructure, and an irregular power supply, still hinder the smooth adoption of AI in many countries and Nigeria in particular. The government and all the relevant stakeholders need to work towards its adoption for more efficient and effective services in the academic libraries in Nigeria.

Recommendations

Based on the challenges discussed, the following recommendations are considered relevant:

i. Government and library management should come together to propose the way forward for academic libraries in terms of meeting the latest standards for the use of AI in libraries.

ii. Library staff should undergo training and retraining in the use of AI in the delivery of library services in order to achieve improved operational efficiency in libraries where the technology is already being adopted.

iii. There should be appropriate policy formulation and implementation before, during, and after the adoption of AI in African academic libraries.

iv. Libraries of higher institutions should intensify efforts to adopt artificial intelligence in providing library services to library users to obtain very high levels of satisfaction.

v. The government and relevant agencies should provide appropriate artificial intelligence hardware and software to help provide library services to users.

References

Amah, V. A. (2004). Reference service and the techniques of handling library clientele. *Nigerbiblio*, 1, 8-12

Amen, O. A. (2004). An appraisal of reference and user's services in the National Library of Nigeria. *Nigerbiblios,* 18(12), 35-40

Asefeh, A., & Asemi, A. (2018) Artificial intelligence (AI) application in library systems in Iran: A taxonomy study Library Philosophy and Practice, 1840

Asemi, A. & Asemi, A. (2018). Artificial intelligence (AI) application in library systems in Iran: A taxonomy study. *Library Philosophy and*

Practice (e-journal). https://digitalcommons.unl.edu/libphilprac/1840.

Chalukya, B. V (2015). Academic libraries and user education. *E-Library Science Research Journal.* Accessed 01/01/2021. 3(5).

Chandwani, A. (2018). An overview of Digital Reference Services. eprints.rclis.org. Retrieved 20 December 2020, from http://eprints.rclis.org/14295/1/DIGITAL_REFERENCE_SERVICES.pdf.

Divayana, D., G., H., Ariawan, I. P. W., Sugiarta, W., & Artanayasa, I. W. (2015). A digital library of expert systems is based at Indonesia Technology University. *International Journal of Advanced Research in Artificial Intelligence*, 4(3), 1–8.

Fernandez, P. (2016). Through library technologies, how will artificial intelligence impact libraries? *Library Hi Tech News*, 33(5), 5–8. https://doi.org/10.1108/LHTN-05-2016-0024

Frankenfield, J. (2021). What is Artificial Intelligence (AI)? *Alternative Investment.* https://www.investopedia.com/terms/a/artificial-intelligence-ai.asp

Heath, N. (2021). What is AI? Everything you need to know about artificial intelligence. Available at: https://www.zdnet.com/article/what-is-ai-heres-everything-you-need-toknow-about-artificial-intelligence/https://www.merriam-webster.com/dictionary/artificial+intelligence.

Jharotia, A.K. (2020). Library automation essential for digital era. Available at:https://www.researchgate.net/publication/339738651_LIBRARY_AUTOMATION_ESSENTIAL_FOR_DIGITAL_ERA/link/5e61ff91a6fdccac3ceeb736/downloadDr Anil Kumar

Korinek, A., & Stiglitz, J. (2017). Artificial intelligence and its implications for income distribution and unemployment NBER Working Paper No. 24174.

Kumar, P.S.G. (2004) Information Technology: Applications. New Delhi: BRPC. Pp 401-425

Merriam-Webster (2022). "Intelligent." *Merriam-Webster.com Dictionary*, Merriam- Webster, https://www.merriam-webster.com/dictionary/intelligent. Accessed 16 Apr. 2022.

Miller, C. C. (2017, May 3). How to prepare for an automated future. New York Times.

Mogali, S. S. (2015) Artificial intelligence and its applications in libraries. *University of Agricultural Science Krishinagar Journal*, 3 (1), 1–11, 2015

Mohaiminul, I., Guorong, C., Shangzhu, J. (2019). An Overview of Neural Network.*American Journal of Neural Networks and Applications.* 5(1); 2019: 7-11. doi:10.11648/j.ajnna.20190501.12

Omame, I. & Alex-Nmecha, J. C. (2020). Artificial intelligence. *ResearchGate*.https://www.researchgate.net/publication/338337072_ ARTIFICIAL_INTELLIGENC E_IN_LIBRARIES. DOI: 10.4018/978-1-7998-1116-9.ch008.

Okorie, O. N. (2016). Library services. In R.U. Ononogbo & P. C. Akanwa, (eds). Basic concepts of library practice. (pp.115-128). Owerri: Supreme Publishers.

Olanlokun, S.O. & Zaid, Y.A (2006). Library exhibition as public relations strategy: The University of Lagos experience. Gateway Journal, 9(20), 1-9

Poelmans, K. (2020). What is Natural language processing? *Textmetrics.* https://www.textmetrics.com/what-is-natural-language-processing-nlp

Sagarjit, R., Sanghamitra, D., & Paramita, M. (2001). Identifying learners' compatibility with enhanced e-learning content using Agent. *International Journal of Computer Applications*, 27(5), 31–34.

Shrivastava, S. (2018). Artificial intelligence and expert system: Intelligent library. *International Journal of Innovation and Research in Educational Sciences.* 5(4),2018, pp476-478. https://www.ijires.org/administrator/components/com_jresearch/files/publications/IJIRES_1299_FINAL.pdf

Sivarajah, U., Kamal, M. M., Irani, Z., & Weerakkody, V. (2017). Critical analysis of big data challenges and analytical methods. *Journal of Business Research*, 70, 263–286. https://doi.org/10.1016/j.jbusres.2016.08.001

Tella, A. (2020). Robots are coming to libraries; are librarians ready to accommodate them? *Library Hi Tech News*, 37(8), 13–17. https://doi.org/10.1108/LHTN-05-2020-0047

Tiemo, P. A., and Ateboh, B. A., Users` Satisfaction with Library Information Resources and Services: A Case Study of the College of Health Sciences Library, Niger Delta University, Amassoma, Nigeria. *Journal of Education and Practice*, 7 (16), 54–59, 2016.

Vijay, K. S. & Sheshadri, S. K. N. (2019). Applications of Artificial Intelligence in Academic

Vijayakumar, D., & Vijan, S. (2011). Application of information technology in libraries: An overview. *International Journal of Digital Library Services*, 1(2), 12–34. 14

Vysakh, C and Rajendra, B. H. (2020). Application of artificial intelligence robot in libraries.

Wang, P. (2018) On defining artificial intelligence. *Journal of Artifical General Intelligence*, 10(2), 1–37.

Wheatley, A., & Hervieux, S. (2019). Artificial intelligence in academic libraries: An environmental scan. *Information Services and Use*, 39(7), 1–10.

Yusuf, T. I., Adebayo, O. A., Bello, L. A., & Kayode, J. O. (2022). Adoption of artificial intelligence for effective library service delivery in academic libraries in Nigeria. *Library Philosophy and Practice (e-journal). 6804.* Available at: https://digitalcommons.unl.edu/libphilprac/6804

Zulaikha, L. (2020). Types of artificial intelligence you should know. https://www.edureka.co/blog/types-of-artificial-intelligence/