

Role of Technological Innovations and Adoption of Artificial Intelligence in Contemporary Library Service Delivery

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Introduction

New development in digital technologies over the years has brought a lot of transformations to the traditional library work. Technology has been wired and integrated into all in-house functions and activities of academic and research libraries all over the world, and the developing countries like Nigeria is not left behind in this race. The application of technology to library services is not a new phenomenon in Nigeria. In the last two decades or thereabout, Nigerian libraries have not been left behind in the adoption and application of technological innovations to enhance library operations and services. Such technologies include computer systems, scanning and printing facilities, electronic resources, CCTV camera, social media and recently the use of RFID technology. However, the application of novel technologies like artificial intelligence has not gained much popularity.

Artificial intelligence has been regarded as the fourth industrial revolution (Park, 2019). AI are machines that can reason, make decisions, learn and interact like humans (CILIP, 2021). According to Holmes et al. (2019), AI can be regarded as computer programmes that carry out tasks that require intelligence when done by humans. On the other hand, the OECD (2019) perceived AI thus:

“An AI system is a machine-based system that is capable of influencing the Environment by making recommendations, predictions or decisions for a given set of objectives. It does so by utilizing machine and/or human-based inputs/data to: i) perceive real and/or virtual environments; ii) abstract such perceptions into models manually or automatically; and iii) use Model Interpretations to formulate options for outcomes”.

The application of artificial intelligence is now very evident in almost every sector of the society around the world. It has brought about transformations and new competitive advantage in many institutions and service organisations. Thus, AI has been found very useful and applicable in many areas like surveillance and cybersecurity, banking and finance, marketing, healthcare management and smart applications (such as facial recognition, voice recognition, location assistant, etcetera). Like in many other disciplines as mentioned above, artificial intelligence (AI) can help libraries update and expand their services and also promote their relevance in the present day digital world. As claimed by ExLibris (nd), libraries can maximize the potentials of AI, and also use the "opportunity to leverage the available practical benefits of artificial intelligence for their own objectives: optimizing workflows, maximizing operational performance, and developing new services."

In the past, libraries were known to acquire, process, store and disseminate only print materials. However, in recent years, this role has changed. Modern day libraries are moving away from being a storehouse of printed information resources to digital service provider (Tella, 2007). This development can be attributed to the universal adoption of computer systems, continuous dependence on computer networks, rapid advancement of the web and Internet as well as escalation in the standard and amount of information. This has forced many libraries to embrace new techniques for storing, retrieving and disseminating information. The modernization of libraries and information centers from analog to digital information hub has enabled ease of information transfer and access, thereby creates a network of libraries. This strategy helps to facilitate resource development, resource sharing and their utilization at various levels. ICTs are now being used to provide as well as access electronic sources such as electronic journals, online and CD-ROM databases, web-based information resources, as well as different types of electronic information resources (Williams & Channveeraiah, 2008).

The introduction of artificial intelligence to university libraries in Nigeria was first witnessed by the University of Lagos in June 2020 through a donation from Platform Capital. The robots (Roboscholar), which are “cloud-based intelligent humanoid robots have the following features: face recognition, surveillance technology, Open API, data management, advert & promotion, book shelf management, research, customizable, and entry validation” (University of Lagos, 2020).

In this wireless and interconnected era, the most practical way to accomplish new aims and targets is by adopting advanced innovative technologies within the day-to-day library operations. Libraries and librarians are trying everything possible to catch up with the trend in the digital world. Interestingly, most of the AI features are already quite familiar in web and mobile application search (such as auto-suggest, ranking by relevance, auto-recommendation, bookmarking and personalization) or word processing (autocomplete, spell-checking, translation, voice recognition). These attributes can be embedded in library functions to make more interactive and attractive to the users. The application of AI in libraries guarantees easy access to information in a more quickly and new ways. A typical example is searching for information through the voice command.

Statement of the problem

The present day information environment is highly ICT-driven. That is, there is high level of dependence on new technological innovations to offer dynamic and cutting-edge information services that meet the changing needs of the users. For libraries to seamlessly provide effective information services that meet up with the current challenges, there is need for the adoption and integration of innovative technologies such as artificial intelligence. However, it is worrisome that many academic libraries in Nigeria are not fully exploiting the advantages of AI for effective service delivery to both the physical and distant users. This study, therefore, tries to explore the possible areas where academic libraries can deploy AI to promote quality and effective service delivery to students, researchers and the faculty.

Aim and Objectives

The aim of this paper is to explore the possible ways in which innovative technologies like AI and robotics can be maximized by academic libraries to promote quality and intuitive services in the digital age. It is aimed at re-awakening the libraries roles in meeting users' growing needs and expectations the application of AI. More specifically, the purpose of this study is to assess the role of innovative technologies in promoting library service delivery. It also intends to know the possible areas that AI can be adopted and applied in library service delivery.

Research question

The following research question is drawn to guide this study.

1. What is the role of innovative technologies in promoting library service delivery?
2. What are the possible areas that AI can be adopted and applied in library service delivery?

Methodology

This study adopts the expository research approach to evaluate the presence and application of artificial intelligence in contemporary library services in Nigeria. Through systematic analysis of literature, the study addresses how academic libraries can utilize artificial intelligence to support innovative library services.

AI application in academic libraries

According to CILIP (2021), apart from impacting daily experiences of people, the new technologies are also changing worldwide procedures, and causing a paradigm shift in all sectors throughout the universe. There are new changes in conventional roles which requires new competencies, new options and new difficulties. In the present day academic library setting, this new change is affecting the general service provision, the librarians and their functions.

Yusuf et al. (2022) examined the adoption of artificial intelligence for effective library services in Nigerian academic libraries, by conceptualising and tracking the genesis of AI. The study affirmed the benefits of utilising AI in library functions. Such benefits include user friendliness, unlimited functions and capabilities, ability to perform complex tasks et cetera. It also identified the problems library management encounter in the process of utilizing AI namely: inadequate funds, technological barriers, job loss and so on. In conclusion, the authors noted that the utilisation of artificial intelligence in library and information centres is creating new standard for effective and efficient service provision in the library. However, there is low utilisation of AI technology in academic libraries in developing countries, which is as a result of the problems earlier identified.

With the integration of and adoption of AI in the information industry, information service delivery in academic libraries is most likely to experience positive transformation (Cox, 2021). Many libraries in developed countries now leverage on direct application of AI and robotics in their day-to-day operations. AI can be applied in the following areas:

- **Robots:** This is an automated or AI-enabled machine which is programmed and designed to carry out specific tasks with or without human intervention. This may include the

utilization of robotics for the retrieval of books (McCaffrey, 2021): such as the automatic arm or robots to pick books from library shelves.



Robots in UNILAG Librar



Automatic Arm in Central Library, Princess Noura University

- **Chatbots:** Chatbot refers to an artificial intelligence (AI) program or application that can replicate a discussion (or a chat) with somebody in natural language by using a messaging applications, blogs, websites, mobile applications or by a smart device. Chatbots and voice assistants can be used for library services (Hopkins & Maccabee, 2018; Mckie & Narayan, 2019); Like it is currently being witnessed in other areas of life, AI technology has also permeated the core areas of library functions where chatbots can be used to provide answers to simple and frequently asked questions on a library web page or blog, alert users of new arrivals and when a book loan is due for return, and refer a patron to related materials.
- the application of machine learning (such as image recognition, speech recognition et cetera) to library resources (Cordell, 2020);
- the adoption of AI in teaching, learning and research in public and school libraries (Nguyen, 2020);
- Similarly, many libraries and information centres are leveraging on AI to harnessing “big data and data analytics both in their operational and service-oriented aspects” (Garoufallou & Gaitanou, 2021).

All these can also be replicated by libraries in developing countries through support from partnering or funding agencies. This will help to improve the efficiency and effectiveness of library service operations in this information-rich and digital economy.

The Need for AI in Nigerian Academic Libraries

Before now, many academic libraries in Nigeria have been struggling to adopt and integrate new technologies like artificial intelligence into the traditional library services. However, the need for the application of innovative technologies to support library service operations has been accelerated by COVID 19. Thus, the need for the application of artificial intelligence in academic libraries in Nigeria can be attributed to many factors such as:

- Change in user behaviour and information landscape
- Rise in global health crisis creating boundary between physical meeting
- Increased digital revolution – such as the inclusion of smart Internet-enabled devices, utilization of digital hi-tech devices in the home, the arrival of AI-enabled assistants in the interfaces used in everyday lives, the keyless and near-auto drive cars and so on (Poole, 2020)

Prospects of AI in Nigerian Academic Libraries

The need to offer users new services is a hot debate among librarians as technology is changing user expectations. Also, the advent of COVID-19 and the resultant safety protocols, librarians across the world are beginning to recognize the benefits of innovative technologies in effective library service delivery. A critical analysis of AI literature has established that a lot of benefits can be derived from the adoption of artificial intelligence, especially in library and information work. According to Ridge (2019), such benefits include but are not limited to:

- developing library character / honour;
- creating collaborations;
- upgrading systems;
- mastering procedures and digitization;
- collecting current descriptive metadata as a by-product from project end result;
- enhance user experience;
- efficiency in library operations.

Challenges of adopting AI in Nigerian Libraries

There are issues and challenges militating against the full adoption of innovative technologies like artificial intelligence in library and information work. These issues have become a recurring decimal in academic and research libraries in Nigeria. Some of these challenges associated with the adoption AI in libraries have been highlighted by CILIP (2021) and others. These among other things include:

- copyright and intellectual property rights (IPR),
- the General Data Protection Regulation (GDPR),
- cost of working at scale,
- reintegration of data from projects into systems
- lack of management / executive support
- inadequate budget and funding
- inability to keep up with increasing trend in new technologies
- difficulty in implementing new technologies

Conclusion

Artificial intelligence is not only changing the general information landscape of libraries around the world, but also affecting the traditional job roles of library and information professionals. Artificial intelligence has the potentials to simplify library functions, enhance efficiency of librarians, and promote quality service delivery to the new generation of library users. Investigations through the literature have shown that only one academic library (University of Lagos Library) in the whole of Nigeria has successfully adopted and utilized artificial intelligence for library services. This is grossly inadequate

Although the prospect of AI adoption in library is high, yet a lot of efforts and investment are required from libraries to guarantee the successful adoption of this innovative technology. This notwithstanding, Nigerian libraries are encouraged to embrace the AI to promote quality service delivery and remain relevant in this highly competitive information environment. Nigerian libraries and librarians can no longer claim to be ignorant of the trend in changing user behaviour and their emerging information needs, therefore, leveraging on the possibilities of AI can go a long way to meet the needs of this digital generation.

Recommendations

Having established the relevance of artificial intelligence in the modern day library and information work, it is therefore recommended that:

1. Academic libraries in Nigeria should fully embrace new innovative technologies and artificial intelligence like chatbots and robotics for delivering quality services and also keep close contact with their users.
2. There is need for librarians to familiarize themselves with artificial intelligence and other related innovative technologies especially in this digital information landscape where users want to access on the go.
3. Libraries should also leverage on the opportunities presented by artificial intelligence to reconnect their remote users, and consequently re-establish their relevance among the user community.
4. With artificial intelligence like chatbots, library services can always be available to users 24/7 to meet their specific needs.

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