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Ogochukwu T. Emiri

Delta State University of Science and Technology, Ozoro, pastorogo2014@gmail.com

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ADOPTION AND UTILISATION OF ARTIFICIAL INTELLIGENCE BY LIBRARIANS IN UNIVERSITY LIBRARIES IN SOUTHERN NIGERIA

BY

Dr. Ogochukwu T. Emiri, CLN

Associate Professor

Department of Library and Information Science

Delta State University of Science and Technology, Ozoro

pastorogo2014@gmail.com, +2348064038721

ABSTRACT

The study investigated how librarians working in the various university libraries in Southern Nigeria adopted and used artificial intelligence. The study raised four research objectives as well as four research questions. A survey design was used for the study with 848 librarians from university libraries in Southern Nigeria as the sample. The entire population was chosen for the study using the total enumeration sample method. Eight research assistants who had received training in how to contact respondents and secure their consent before distributing the structured questionnaire designed by the researcher assisted in the instrument distribution process. The researcher was able to retrieve 704 copies of the 848 questionnaires that were given to the responders. However, the return rate was 83%, which is a respectable amount. The descriptive statistics approach was used to analyse the data that the questionnaire produced. The results showed that there has been little adoption of AI in university libraries in Southern Nigeria. The research also reveals that security scanning devices at university libraries' entrances and exits are the most prevalent AIs, while other AIs like robots, chatbots, face recognition, touch recognition, RFID technologies, humanoids, AI classification tools, machine-readable catalogues, and AI smart features are still lacking in Southern Nigeria's university libraries. The results of this study also suggest that the university library's librarians are knowledgeable about the many ways that AI may be applied to provide services. The study's findings indicate that adoption hurdles include considerable disruption brought on by AI to conventional library services, a lack of skills and the need for training prior to adoption, erratic power supply, a lack of suitable infrastructure for adoption, among other problems. It was recommended in the study that training should be organized for librarians to boost their skills in the use of AI for service delivery and university and library management should be committed and give the needed support towards the adoption of AI by making available the needed infrastructure to ensure their swift implementation.

KEYWORDS: Adoption; Use; Artificial Intelligence; Librarians; University Libraries; Southern; Nigeria

INTRODUCTION

The librarians' adoption and deployment of artificial intelligence (AI) in libraries attached to universities in Southern Nigeria is a topic of immense importance in today's rapidly changing digital landscape. Artificial intelligence, as defined by Oracle (2022) sees AI as software or hardware that can carry out tasks by simulating human intellect and then iteratively improves itself using the data it gathers. AI encompasses a wide range of fields which is not limited to computer science alone, but also philosophy, linguistics, psychology as well as other fields of life (Deloitte, 2022). An emerging trend that is receiving more attention as the world transitions to a more digitally based economy is the application of AI in libraries. Omame and Alex-Nmecha (2020) posited that AI has the potential to revolutionize the way libraries are managed, from the way library materials are catalogued and organized to the way librarians and patrons interact.

For university libraries to fully deploy AI for meeting their various service needs, they need to first adopt and implement these tools. According to Ajani, et al. (2022), implementing artificial intelligence (AI) in university libraries can increase the effectiveness of library operations in general and reference services in particular. AI can help libraries organise, store, and retrieve information to better manage their digital holdings. The application of AI in university libraries, according to Sivarajah et al. (2017), improves dataset assessment, particularly for large datasets that are utilised for analysis spanning many datasets. It also aids in the elimination of tiresome and recurring tasks. As a result, integrating AI into library operations helps to foster the growth of abilities that transcend human intellect. Libraries, particularly those at universities, have had difficulty adopting digital technology, and they also show resistance to change when using new technologies for a variety of library functions in developing nations like Nigeria (Wheatley & Hervieux, 2019).

Similarly, scholars in the literature have often argued that AI can be used in the area of library security, as university libraries are now deploying AI-based facial recognition technology to track and monitor users, particularly service areas (American Library Association, 2022; Datagen, 2022). Only a few scholarly research works have been published in the research field, making the adoption, implementation, and use of AI in university libraries a relevant subject and a relatively new notion. This information was discovered through literature searches. Bhatia (2018) asserted that there is a disconnect between AI research and AI applications in the literature, which serves to support the aforementioned.

The purpose of this study was to fill a knowledge vacuum and serve as a resource for academics working on similar projects on how librarians in university libraries in Southern Nigeria are using artificial intelligence.

STUDY OBJECTIVES

The study's aims are as follows:

1. Determine the extent to which librarians in university libraries in Southern Nigeria have used AI.
2. Discover the categories of AI that university libraries may use.
3. Look at how AI is used in university libraries to provide services.
4. Identify the obstacles that prevent AI from being used by university libraries.

RESEARCH QUESTIONS

The investigation offered responses to the following questions:

1. What is the adoption rate of AI by university libraries in Southern, Nigeria?
2. What kinds of AI are available for university libraries to use?
3. How do university libraries employ AI to offer services?
4. Describe the obstacles that prevent the adoption of AI in University Libraries?

LITERATURE REVIEW

The literature review was carried out in line with the research objectives of the study

Adoption Level of AI by Librarians in University Libraries

The extent of AI usage by librarians in academic libraries is presently the subject of a very portion of empirical research in the literature. Yusuf et al. (2020) assessed the application of artificial intelligence for efficacy in library service delivery in a study of university libraries in Nigeria. The study has unequivocally shown that the adoption of artificial intelligence by librarians in university libraries in Nigeria is relatively low as a result of a wide variety of challenges specific to developing nations. However, as noted by Grant and Camp (2018), many academic libraries, mostly in wealthier nations, have adopted AI to meet the many service demands of their customers, including reference and circulation services. The readiness and knowledge of librarians to adopt artificial intelligence for services and procedures in academic libraries in Nigeria was also evaluated by Ajani, et al. in 2022. Due to their conflicted emotions, the results showed that the librarians are not yet prepared to use artificial intelligence in their academic library. As a result of this data, it can be concluded that most academic libraries in Nigeria have a poor adoption of AI.

In yet another study, Okunlaya et al. (2022) assessed an unique artificial intelligence framework for library operations in preparation for the higher education digital revolution. The collection of existing research suggests that university libraries have a low acceptance rate for using AI to provide innovative substitutes for the services they currently provide. In practically every area of academic and research libraries today, according to Olayode (2022), technology is employed, and Nigeria is not left behind because the acceptance and application of technology in Nigeria is not a recent concept. Manjunatha and Patil looked at the use of smart technology in engineering college libraries in Karnataka (2020). The data suggests that most engineering university libraries are already familiar with smart technologies and have adopted blockchain, augmented reality, artificial intelligence, and other cutting-edge systems.

The Types of AI available in University Libraries

However, Olayode (2022) looked into the use of artificial intelligence and technical improvements in the provision of library services with regard to the kinds of AI that may be applied in academic libraries. According to the report, the University of Calabar already uses Robots and Chabot to handle part of its service needs. Nawaz and Saldeen looked at the application of AI in library reference services (2020). The study's findings demonstrated that Chabot might be used to effectively provide library reference services. The application of AI in libraries was the subject of study by Oname and Alex-Nmecha (2020). The study underlined the use of expert systems for shelf reading, book reading robots, and library reference services, among other applications. Yu, et al (2019) investigation of smart libraries' usage of AI. The study cites a few artificial intelligence applications that can be employed in smart libraries, including face recognition, chatbots, and self-service AIs. Ali, et al. (2020) assessed how university librarians felt about and used AI tools. According to the study, university libraries may utilise the following AIs: Google Chat for chat reference, Google Drive, Drive One, cloud computing for large data, RFID, 3M Gates, thumb verification, and Google Translator for translation services, among others. Al-Aamri and Osman (2022) examined the potential of artificial intelligence to enhance library operations and services. Researchers were able to demonstrate via their examination that robots assist in providing library services. Vysakh and Babu (2020) looked about robotic AI deployment in libraries. The findings indicated that most jobs carried out in libraries can be done by robots.

The use of AI for service delivery in university libraries

According to the literature, researchers have looked at ways to employ AI to provide library services. Nawaz, Gomes, and Saldeen (2020) looked on artificial intelligence methods for library resources and services during the COVID-19 epidemic. The study demonstrates that a number of library services can benefit from the use of AI. Nevertheless, AI can be employed for user identification in speech recognition or typing, monitoring of users as they use library resources and services, chatbots for reference services, robot assistants, drone surveillance for library security, AI alarms for reminding users when it's time for their scheduled appointment with a librarian, and AI-based tutorials for keeping users up to date with the most recent findings and

discoveries in their field. The AI revolution in libraries is projected to have a significant impact on a number of areas, including data processing, literacy, and online and virtual services (Winkler & Kiszl, 2021). Studies have shown that humanoid robots can be used in libraries for a variety of tasks, including instruction, community building, and assistance for librarians. Other applications for AI in libraries include chat services for online messaging, automation of library procedures, and improving the effectiveness of service delivery (Nguyen, 2020; Nawaz & Saldeen, 2020; Igbinoia & Okuonghae, 2021). A study on intelligent talking robots to improve library services was conducted by Yao et al. (2015). The results make it clear that the Xiaotu robot, which can interact with users and provide assistance, is effective in enhancing library reference services. Fernandez (2016) also made the case that artificial intelligence may be used in a number of library operations areas, relieving librarians of some tedious chores. To support the aforementioned, Corrado (2021) pointed out that AI can be applied in several technical service areas, such as assigning and creating subject headings, classification, and metadata description. Librarians would serve as supervisors and control for metadata ethics and privacy in these applications. In 2019, Mogali looked into how artificial intelligence is used in libraries. The results demonstrate that artificial intelligence can be used for expert systems in libraries, such as Refsearch, pointers, online reference help, Amswerman, and Plexus. Expert systems have also proven beneficial for carrying out tasks related to acquisition, cataloguing, classification, indexing, and other library procedures.

The challenges that militate against the adoption of AI in University Libraries

The literature review's discussion of the obstacles to AI adoption in university libraries will be the focus of this section. According to Tait and Pierson (2022), the adoption of AI and robots in libraries may be hampered by a lack of skills and the need for training before implementation. In line with the above viewpoint, Hervieux & Wheatley (2021) in their study argued that the low adoption rate of AI and Robots in libraries is due to a lack of knowledge of these technologies. In their investigation of the use of chatbots in university libraries, Kaushal and Yadav (2022) found that, despite the enormous advantages of chatbots for improving library reference services, their main drawback high privacy intrusion should be eliminated by programme designers during the development phase. In their investigation of some of the barriers to AI adoption in academic libraries, Yusuf et al. (2022) primarily focused on librarians' low awareness of how to use AI to meet their service needs and the high disruption that AI has caused to traditional library services, which continues to shock most library professionals. From a different angle, the study by Korinek and Stiglitz (2017) asserted that the use of AI poses a threat to librarians' work and that caution should be exercised before widespread implementation in libraries. The results of the previous study largely align with the World Bank Development Report (2016), which suggests that the adoption of AI will cause employment losses in the majority of developing countries, with the majority of these losses occurring in Ethiopia, China, Thailand, and India. Liao (2019) conducted research on the benefits of robots for library operations. The researcher highlighted a few obstacles that might prevent libraries from adopting robots. These include the high skill requirements to work with robots, the need to redesign workflow, the fact that robots are only designed to perform

one or two tasks and cannot be used for all library activities, the fact that robots occasionally have temper tantrums that could disrupt library services, and others. Oghenetega, Umeji, and Obue (2014) cited a number of factors that work against the adoption of these AI in library operations, including poor maintenance ethics, inadequately trained staff, high costs, networking issues, a lack of adequate facilities, an epileptic power supply, and economic, political, and technological issues.

RESEARCH METHODOLOGY

A survey research design was utilised in the study. The 84 university libraries in Southern Nigeria's forms the scope of the study. The exact population of the study is 848 librarians at the university libraries in Southern Nigeria. The total enumeration sampling approach was used to choose the entire population included in the investigation. Eight research assistants who had been trained on how to get in touch with participants and get their permission before presenting them with a structured questionnaire were engaged in the study. Due to the complexities in retrieving the questionnaires, the distribution process took 4 months. The researcher was able to retrieve 704 of the 848 questionnaires that had been given out to respondents and determined to be suitable for research. But there was an 83% response rate, which is a respectable return rate. The descriptive statistics method was used to analyse the data collected through the questionnaire.

RESEARCH FINDINGS

Demographic description of the Study Participants

Distribution of the Respondents by Sex

Table 1: Distribution of the Study Participants By Sex

Sex	Frequency	Percentage %
Male	332	47%
Female	372	53%
Total	704	100%

From Table 1, 47% of the study participants were male, while 53% are female. This finding point out that more females participated in the study than males.

Distribution of the Respondents by their Cadre

Table 2: Distribution of the Participants by Cadre

Cadre of Librarians	Frequency	Percentage
Graduate Assistant	54	8%
Assistant Librarian	172	24%
Librarian II	238	34%
Librarian I	206	29%

Senior Librarian	20	3%
Deputy University Librarian	14	2%
University Librarian	---	---
Total	704	100%

From Table 2 above, most of the librarians that participated in the study are in the Librarian II cadre (238/34%), followed by Librarian I (206/29%), Assistant Librarian (172/24%), Graduate Assistant (54/8%), Senior Librarian (20/3%), and Deputy University Librarian (14/2%). No university librarian took part in this study.

ANALYSIS OF THE KEY FINDINGS OF THE STUDY

Research Question 1: What is the adoption level of AI by librarians in University Libraries in Southern, Nigeria?

Table 3: The adoption level of AI by librarians in University Libraries in Southern, Nigeria

Artificial Intelligence Adopted in University Libraries	Adopted	Not Adopted
Robots are adopted for use in my university library	56(8%)	648(92%)
Chatbots are embedded in the library Website for swift reference services.	246(35%)	458(65%)
Face recognition technology is adopted for security purposes in my university library	18(3%)	686(97%)
Thump recognition technology is adopted in my University Library	38(5%)	666(95%)
RFID technologies are adopted in my university library	86(12%)	618(88%)
Humanoids are adopted in my university library	22(3%)	682(97%)
AI classification tools like, Shelf Pro, CUTT-x. Coal Sort and N-cube are adopted in my university library	12(2%)	692(98%)
Machine Readable Catalogue (MARC) is adopted in my university library	78(11%)	626(89%)
Artificial intelligence smart features are adopted in my university library	102(14%)	602(86%)
Security Scanning Machines are adopted for scanning users at the point of entrance in my university library	587(83%)	117(17%)

From Table 3 above, it is glaring that the adoption of AI in university libraries in Southern, Nigeria is low.

Research 2: What are the types of AI that can be available in University Libraries?

Table 4: The types of AI that can be available in University Libraries

Types of AI Available in University Libraries	Frequency	Percentage
Robots are available in my university library	58	8.2%
Chatbots are available in my university library	286	40.6%
Face recognition technologies are available in my university library	22	3.1%
Thump recognition technology is available in my University Library	28	3.9%
RFID technology is available in my university library	92	13%
Humanoids are available in my university library	18	2.5%
AI classification tools are available in my university library	14	1.9%
Machine Readable Catalogue (MARC) is available in my university library	76	10.7%
Artificial intelligence smart features are available in my university library	201	28.5%
Security Scanning Machines are available for scanning users at the point of entrance in my university library	595	84.5%

It is obvious from Table 4 above that security scanning devices, which are purchased for scanning patrons and visitors at the entrance/exit point of the university library and critical service locations, are the sole AI technology accessible in the majority of university libraries in Southern, Nigeria. Most university libraries in Southern Nigeria don't have access to other AI tools like robots, chatbots, face recognition, touch recognition, RFID technologies, humanoids, AI classification tools, machine-readable catalogues, or AI smart features. This data suggests that the university libraries in Southern Nigeria have a limited selection of AI technologies.

Research Question 3: How is AI used for service delivery in university libraries?

Table 5: The use of AI for service delivery in University Libraries

Note: SA: Strongly Agree; A: Agree; D: Disagree; SD: Strongly Disagree

S/N	The Use of AI for Service Delivery	SA	A	D	SD	Weighted Mean
1.	User identification in the area of speech, or typing, monitoring	348	102	204	50	3.06
2.	AI chatbots can be used for reference services	504	78	20	102	3.39
3.	Drone Surveillance for Library Security	204	208	214	78	2.76
4.	AI alarms for notifying users time of their scheduled visit with a librarian	148	124	328	104	2.45
5.	Humanoid Robots can be used in libraries for teaching, community building, assistant to the librarians	176	234	164	130	2.65
6.	AI can be used for automating library routines	502	56	112	34	3.47
7.	For technical service delivery like assigning and creating subject's headings, classification as well as metadata description	402	168	86	48	3.31
8.	Face Recognition can be used for Library Security	124	186	236	158	2.39
9.	For online messaging needs	422	184	60	38	3.40
	Weighted Mean					2.98
	Criterion Mean					2.50

Since the weighted mean in Table 5 was greater than the criterion mean of 2.50, it can be inferred that librarians are quite sophisticated about the various ways AI can be used to deliver services in university libraries.

Research Question 4: What are the challenges that militate against the adoption of AI in University Libraries?

Table 6: The challenges that militate against the adoption of AI in University Libraries?

Note: SA: Strongly Agree; A: Agree; D: Disagree; SD: Strongly Disagree

S/N	Challenges against AI Adoption in University Libraries	SA	A	D	SD	Weighted Mean
1.	The lack of skills and the need for training before the adoption of AI in university libraries.	510	34	32	128	3.32
2.	The issue of high privacy intrusion by Chatbots	334	126	86	158	2.90
3.	Low awareness level by librarians on how to apply AI for their service needs	126	87	124	367	1.96
4.	High disruption brought by AI on traditional library services	498	108	38	60	3.48
5.	AI is perceived as a threat to the job of librarians in university libraries	402	96	98	108	3.12
6.	The need to redesign workflow can be a major challenge for Librarians in the adoption of AI	208	214	164	118	2.73
7.	AI in the form of robots can only perform specific routines hence they cannot be adopted for all library services.	136	228	208	132	2.52
8.	Lack of sufficient infrastructure to adopt AI in university libraries	346	202	68	88	3.14
9.	Erratic Power Supply	402	122	68	112	3.15
10.	Technical issues can affect the full adoption of AI in university libraries.	202	76	146	280	2.28
	Weighted Mean					2.86
	Criterion Mean					2.50

The results of Table 6 above showed that the weighted mean was 2.86, which is higher than the criterion mean of 2.50, making it clear that the adoption of AI is seriously hindered by a number of issues. The study's findings specifically mention the high disruption that AI will cause to traditional library services, the lack of skills and the need for training prior to the adoption of AI

in university libraries, unstable power supplies, and the lack of adequate infrastructure for the adoption of AI in university libraries, among other issues.

DISCUSSION OF FINDINGS

From the demographic distribution of the study participants, it was revealed that more females participated in the study than males. Also, it was revealed that the majority of the study participants are in the librarian II cadre.

The study findings were discussed according to the objectives of the research.

The adoption level of AI in University Libraries in Southern, Nigeria

The results showed that there has been little adoption of AI in university libraries in Southern Nigeria. This result is consistent with a research by Yusuf et al. (2020), which found that a variety of variables contribute to the low adoption rate of artificial intelligence among librarians at university libraries in Nigeria. The results support a study by Ajani, et al. (2022) that found that due to their conflicted emotions, academic librarians are not yet ready to use artificial intelligence in their libraries. As a result of this data, it can be concluded that most academic libraries in Nigeria have a poor adoption of AI. This result contrasts with a research by Grant and Camp (2018) that found that many academic libraries, mostly in wealthy countries, have embraced AI to suit their users' different service needs, including reference and circulation services.

The Types of AI that can be Adopted in University Libraries

The findings showed that the only AI technology available in the majority of university libraries in Southern Nigeria is security scanning equipment, which is purchased for scanning visitors and patrons at the entrance/exit point of the university library and crucial service sites. Other AI tools including robots, chatbots, facial recognition, touch recognition, RFID technologies, humanoids, AI classification tools, machine-readable catalogues, or AI smart features are not often available in Southern Nigerian university libraries. This information reveals that there is a small assortment of AI technology available in the university libraries in Southern Nigeria. Contrary to what Olayode (2022) found, the university of Calabar is already deploying Robots and Chabot to meet some of its service needs.

The use of AI for service delivery in University Libraries

It can be deduced from the results that the librarians had a thorough understanding of the numerous ways AI may be utilised to offer services in university libraries because the weighted mean 2.98 was greater than the criteria mean, which was 2.50. This is in line with the majority of past research that shown how AI may be used to improve a range of library services (Nguyen, 2020; Saldeen, 2020; Igbinoia & Okuonghae, 2021). The Corrado (2021) research also demonstrated how technical services, such creating and assigning subject headers, categorising data, and describing metadata, may all profit from the use of AI. Chatbots may be utilised to build AI for reference services, as shown by the Sanji, et al. (2022) study.

The challenges that militate against the adoption of AI in University Libraries

The results showed a weighted mean of 2.86, which is higher than the criterion mean of 2.50, making it clear that the adoption of AI is severely hampered by a number of issues. The study's findings specifically point out the high disruption that AI will have on traditional library services, the lack of skills and the need for training prior to the adoption of AI in university libraries, the unstable power supply, and the lack of adequate infrastructure for the adoption of AI in university libraries, among other challenges. This finding is in line with a study by Yusuf et al. from the year 2022, which found that most library staff are still in shock over the high disruption that AI has brought to traditional library services, which has an effect on their adoption of AI technology. This outcome is in line with earlier studies that discovered that the librarians' lack of competence has considerably hindered the adoption of AI in university libraries (Oghenetega, Umeji, and Obue, 2014; Liao, 2019; Tait and Pierson, 2022).

CONCLUSION AND RECOMMENDATIONS

The study examined the adoption and utilization of artificial intelligence by librarians in universities in Southern Nigeria. Artificial intelligence is one of the key advancements of the Fourth Industrial Revolution, specifically in the service delivery frameworks of businesses and organisations (AI). Libraries and information centres are actively monitoring developments in the usage of AI in order to satisfy their different service demands. Robots, humanoids, face recognition software, drones, chatbots, thumb recognition, and other types of artificial intelligence (AI) are becoming more and more common and can be employed for library services. The study found that Southern Nigeria has adopted AI for library services extremely slowly. The most popular tool employed by university libraries in Southern Nigeria to prevent unlawful seizure or theft of library materials by bad users is the security scanning equipment at entry/exit points of libraries. AI has the potential to be useful for university libraries since it can be incorporated to suit library service requirements. Examples include using chatbots for reference services, facial recognition AI for user mapping and collection security, drones for surveillance, and humanoids for routine library chores like welcoming guests and storing volumes, among others. Despite these possibilities, Southern Nigerian institutions have not fully adopted AI, and as a result, adoption rates in university libraries are still very low. The drawbacks include, among others, the significant disruption that AI causes to traditional library services, the lack of skills and the need for training before AI is implemented in university libraries, erratic power supplies, and an inadequate infrastructure for implementing AI in university libraries. However, to improve the adoption of AI for the betterment of services in university libraries in Southern, Nigeria, the researcher recommends that:

1. Training should be organized for librarians to boost their skills in the use of AI for service delivery.

2. University and library management should be committed and give the needed support towards the adoption of AI by making available the needed infrastructure to ensure their swift implementation.
3. Orientation should be given to librarians to change the perception that AI would take over their jobs rather they should see AIs as what can complement their efforts in university libraries.

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