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Awareness and Adoption of Artificial Intelligence for Effective Library Service Delivery in Academic Libraries in Kwara State Nigeria

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ABSTRACT

The study examined the awareness and adoption of artificial intelligence for effective library service delivery in academic libraries in Kwara state Nigeria. This study adopts the survey design. The study population consists of 154 library staff in 6 academic libraries in Kwara state Nigeria, The study was limited to four (4) academic libraries, which are University of Ilorin, Kwara State University, Malete, Federal Polytechnic Offa and Kwara State Polytechnic Ilorin. The sample size is, therefore one hundred and thirty-six (136) derived from the study's total population. The questionnaire was used as the major instrument for the study. The data collected in this study were analysed using Statistical Product for Service Solutions (SPSS). The study's findings revealed that AI is beneficial to academic libraries for effective library services and operations because it helps to eliminate repetitive and tedious task; it helps to make library services more effective and efficient to improve user satisfaction, among others. It was revealed from the findings that academic libraries in Nigeria are not ready for the integration of AI systems in library operations and services; libraries are under-equipped with ICT facilities, which is an integral part of AI to function; academic library employees have a negative attitude toward using ICT to perform library services so bring AI is not an option for now; among others. The study recommended that there should be an improved budget for library automation, procuring the technology, and training library personnel, there is a need for adequate funding for academic libraries in Nigeria, among others.

Keywords: Awareness, Adoption, Artificial Intelligence, Library Service Delivery, Academic Libraries

Introduction

Intelligence is the ability to reason, gain knowledge, acquire skills, and then apply those skills when needed. The concept of building computers or other robots with human-like behaviour and learning has attracted a lot of attention. The ability to observe, reason, and act is innate in humans, and it develops and gets better over time due to various factors. Artificial intelligence is used in library systems for various tasks, such as subject indexing, shelf reading, collection creation, shelf cataloguing, shelf reading services, and information retrieval systems. According to Tella (2020), developed countries have adopted and utilised AI technologies in almost every area of their lives, in contrast to libraries in poor countries still having difficulty getting off the ground.

Since Corke (2013) predicted that artificially intelligent systems, or robots, will play a significant role in technology in the twenty-first century, it is necessary to fully capitalise on the wealth of advantages this technology offers for the provision of cutting-edge and optimal services in libraries by researching this technology and all of its advantages and disadvantages. In summary, the primary justification for deploying AI in libraries is that, compared to humans, it is less prone to make mistakes and can work continuously for seven days without experiencing fatigue, allowing librarians to focus on other duties. In the end, computers' capacity to operate at scales and speeds faster than humans will enable the processing of library items to be completed swiftly, effectively, and efficiently, enhancing the delivery of library services overall. The four primary infrastructures of higher education institutions are laboratories, teacher's classrooms, equipment, and libraries with various information resources that can support teaching, learning, and research initiatives (Tiemo & Ateboh, 2016). Libraries are the center of an educational institution and a location where everyone may access information, irrespective of age, gender, religion, political or ethical views, or other characteristics. Information resources have been moved from books to databases, audiotape collections, video collections, and more. Libraries have also been automated and their collections have been digitised. Currently, artificial intelligence is being used in library operations (Vijayakumar & Vijan, 2011).

The library serves as the hub of any higher education institution. Any institution's strengths and weaknesses can be determined by its operations, services, and global and local library visibility. AI is now being used in library services due to the coronavirus outbreak in 2019–2020, which forced many libraries to examine ways to enhance operations and services internally. The majority of library employees are oblivious to the integration of AI into library services, according to anecdotal data. A few people are also afraid of information and communication technology (ICT) and worry that robots would

replace humans in their professions if robots take over the library. ICT adoption for library operations and services is similarly low, not to mention the usage of AI, which is more expensive and requires specialised knowledge to employ.

The University of Lagos is the only school in Nigeria utilizing AI in certain aspects of its operations and library services. The study focuses on the awareness and adoption of AI for efficient library service delivery in academic libraries in Kwara State, Nigeria, as library professionals have limited knowledge about using AI for library services and operations.

Objectives of the Study

The general objective of this study is to investigate the awareness and adoption of artificial intelligence for effective library service delivery in academic libraries in Kwara State, Nigeria. The specific objectives are to:

1. find out the areas artificial intelligence can be applied in academic libraries in Kwara State Nigeria;

2. identify the perceived benefits of artificial intelligence to library operations and services in academic libraries in Kwara State Nigeria;

3. examine the perceived challenges facing AI adoption in academic libraries in Kwara State Nigeria.

Research Questions

The following research questions guided the study:

1. What are the areas artificial intelligence can be applied in the   library in Kwara State Nigeria?

2. What are the perceived benefits of artificial intelligence to library services in academic libraries in Kwara State Nigeria?

3. What are the perceived challenges facing the adoption of AI in academic libraries in Kwara State Nigeria?

Literature Review

According to Adeoye and Popoola (2011), the concept of librarianship is predicated on providing users with pertinent resources and good library services. Academic libraries are typically assessed based on how significantly they contribute to the parent institutions' accomplishments (Dewey, 2014). Academic libraries are essential components of their host institutions, and over time, they have widened their service offerings to meet institutional aims and purposes. More recently, they have worked to express their ideals to their unique user groups (Egberongbe, 2018). Due to the library's special position within the system, Brown and Malenfant (2015) believed that its services are an excellent way to ensure that an academic performs its duty.

Artificial intelligence (AI) is the programming and development of computer systems to carry out tasks that need human intelligence, such as speech recognition, visual perception, conversing, language translation, decision-making and emotional responses (Irizarry-Nones, Palepu & Wallace, 2017). The technology that gives machines the ability to plan, move, learn, reason, solve problems, and to some extent be creative is known as artificial intelligence, according to Heath (2018). AI also refers to intelligent devices or systems that mimic human intelligence functions and advance the study of human intelligence (2016). Similarly, Omame & Alex-Nmecha (2020), reported that, artificial intelligence is a branch of computer science that focuses on how computers learn (Machine Learning), interpret information, and perceive the world through their eyes, including through character recognition, image analysis, 3D perception, and eye function modeling.

Due to its potential for organizing and making massive informational collections accessible, artificial intelligence is important to libraries (ALA, 2019). According to Sridevi and Shanmugam (2017), artificial intelligence is the cutting-edge technology utilized to administer the digital library. The development of computer systems or machines that think, behave, and challenge human intelligence is the ultimate promise of artificial intelligence, which has obvious significant consequences for the field of librarianship. Artificial intelligence mimics how humans perceive and process information, is more than just an intelligent system or software program (Sridevi & Shanmugam, 2017). In other to offer knowledge-based services to library patrons and employees, intelligent library automation systems rely on artificial intelligence technologies.

All libraries carry out frequent and infrequent basic operations and activities regardless of the type. Additionally, these procedures—carried out regularly—are frequently connected to the library's services. According to Bharat (2015), the basic duties of many libraries include choosing and gathering information, organizing information, and providing services to users. Libraries typically handle cataloging, classification, and indexing of information resources in the technical services division; selection, acquisition, processing of newly acquired information resources and weeding in the collection development division; responding to users' questions in the reference services division; and performing circulation duties like registering library users, charging and discharging of materials, taking user statistics, etc. In addition to other unique activities like administrative tasks, user education, binding, and many more, the aforementioned operations are the fundamental ones that take place in libraries.

Also, Kristin (2016) makes it clear that libraries can modify the focus and attention thanks to AI applications. The way we navigate the information is constantly changing. AI provides a very helpful shortcut for using this knowledge and getting better results. The libraries are putting themselves in a position to benefit from the use of cognitive computing in general and artificial intelligence in particular for their potential utility as a tool for improving the quality of library services. Moreover, to fulfill the changing information needs of library customers, the development of AI technology has sped up

and improved the delivery of these services. AI technology have aided in both the introduction of new services and the improvement of library service delivery. Academic libraries in Nigeria have not yet adopted and used AI, in spite of the potential that it holds for libraries. Given that there has been relatively little study linking artificial intelligence (AI) to librarianship, this may be because there is a low degree of awareness and adoption of AI's importance in libraries.

Additionally, financial constraints, inadequate infrastructure, inadequate skills and competencies, resistance to change, intrusion issues, negative perception from librarians, security and lack of exposure to international standards are some of the difficulties libraries face in adopting new and innovative technological solutions. Oghenetega, Umeji, and Obue (2014) listed additional obstacles to the adoption of AI technologies in libraries as poverty (cost), poor maintenance culture, poor networking, erratic power supply, a lack of trained staff, illiteracy, a lack of adequate infrastructure, government policy structure, technological factors, cultural factors, political factors and economic factors. Nevertheless, it should be recognized that these difficulties are endemic to African civilization and are faced by African libraries in the application of technological innovation.

METHODOLOGY

This study adopts the survey design. The population of the study consists of 154 library staff in the 6 academic libraries in Kwara state, Nigeria. The study was limited to four (4) academic libraries which are University of Ilorin, Kwara State Unviersity, Malete, Federal Polytechnic Offa and Kwara State Polytechnic Ilorin. Therefore, the sample size is one hundred and thirty-six (136) which was derived from the total population of the study. The questionnaire was used as the major instrument for the study.

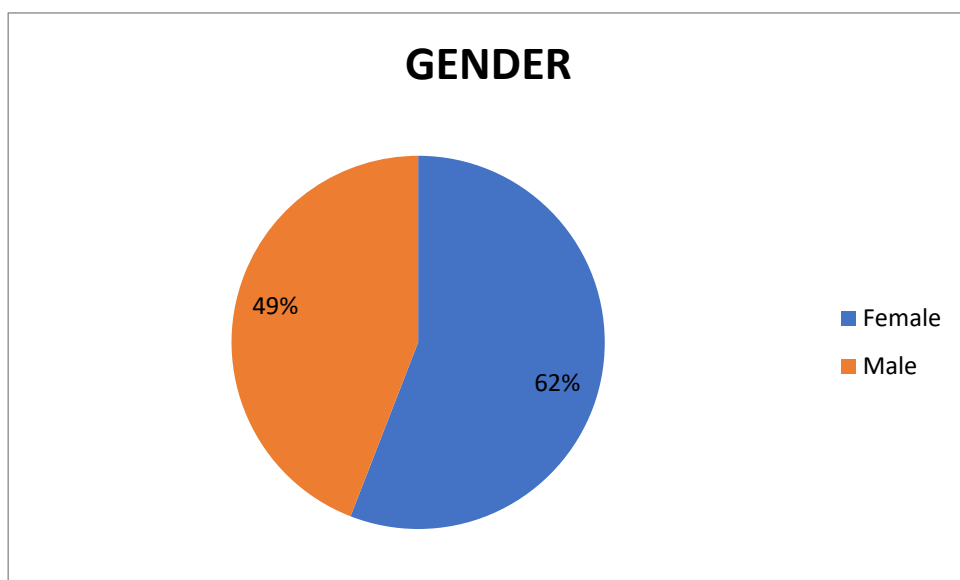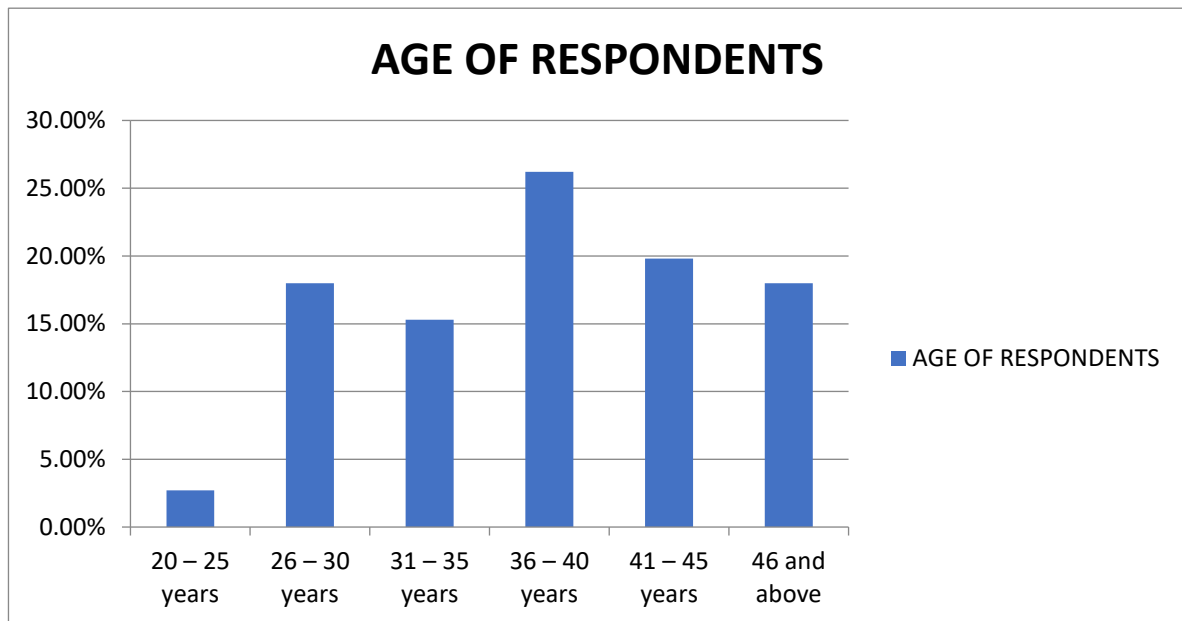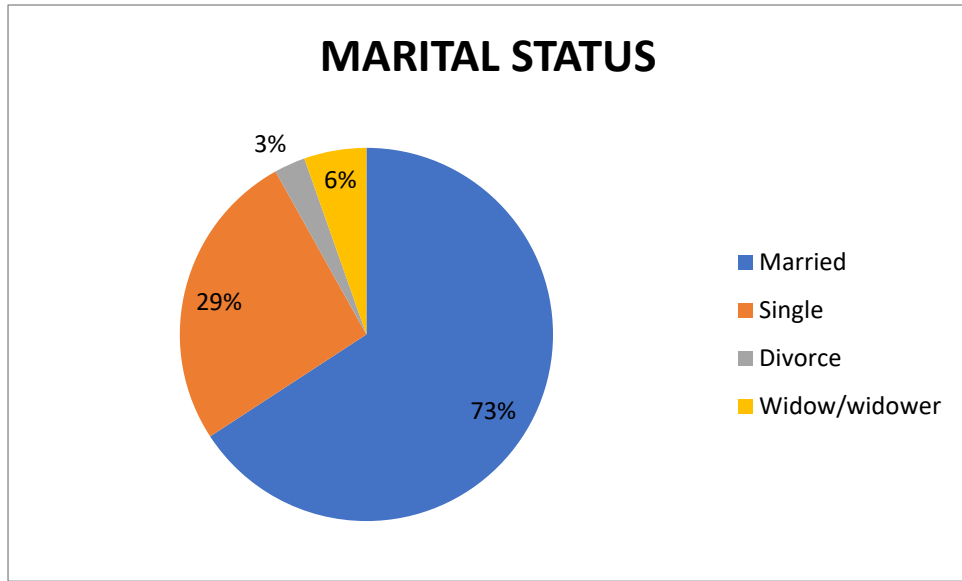## RESULTS AND DISCUSSION

Demographic data of the Respondents

Figure 1: Gender of respondents

MARITAL STATUS

AGE OF RESPONDENTS

The information contained in demographic data of respondents shows that the distribution according to gender revealed that the majority of the respondents were females (62, 55.9%) while 49 (44.1%) of the respondents were males. This result implied that there was a little disparity in gender distribution of library staff in Kwara state Nigeria, as there were more female library staff than their male counterparts. In terms of marital status, (73, 65.8%) of the respondents constituting the majority were married while the remaining were single (29, 26.1%), divorce (3, 2.7%) and widow/widower (6, 5.4%). In addition, the data revealed that the highest number of respondents (29, 26.2%) was found in the age bracket of 36 to 40 years, followed by (22, 19.8%) who were 41-45 years age bracket, (25, 18%) were within the age of 26-30 years and 46 and above (20, 18%) respondents were found to be between 31 and 35 years and (3, 2.7%) were between age 20 – 25 years.

Table 4.1 Areas artificial intelligence can be applied in academic libraries in Kwara State

Statement	SA		A		D		SD			
	N	%	N	%	N	%	N	%	$\bar{x}$	SD
Application of Expert Systems in Reference Service	100	90.1	11	9.9	0	0	0	0	3.31	0.81
Application of Expert System in Cataloguing	93	83.8	18	16.2	0	0	0	0	3.22	0.75

Application of Expert System in Classification	81	73	30	27	0	0	0	0	3.17	0.73
Application of Expert System in Indexing	90	81.1	21	18.9	0	0	0	0	3.20	0.74
Application of Expert System in Acquisition	101	91	10	9	0	0	0	0	3.17	0.73
Application of Natural Language Processing in Library Activities	16	14.4	24	21.6	41	36.9	30	27	2.48	0.86
Application of Pattern Recognition in Library Activities	24	21.6	16	14.4	30	27	41	36.9	2.56	1.09
Application of Robotics in the Library Activities	100	90.1	11	9.9	0	0	0	0	3.22	0.86

Key: Strongly Agree (SA-4) Agree (A-3) Disagree (D-2) Strongly Agree (SA-1). $\bar{x}$ = Mean, δ = Standard Deviation.

Decision Rule: 1-1.49 = VL (Very Low), 1.5-2.49 = L (Low), 2.5-3.49 = H (High), while 3.5-4 = VH (Very High)

Table 1 presented the result of the areas artificial intelligence could be applied in academic libraries in Kwara state Nigeria. The weighted mean was used as the benchmark for decision rule. Majority of the respondents stated that artificial intelligence should be applied in reference service ($\bar{x}$ = 3.31), application of expert system in cataloguing and application of robotics in the library activities ($\bar{x}$ = 3.22), application of expert system in indexing ($\bar{x}$ = 3.20), application of expert system in classification and acquisitions ($\bar{x}$ = 3.17), application of pattern recognition in library activities ($\bar{x}$ = 2.56). This implies that most of the library staff are of the view that artificial intelligence could be applied in references section, cataloguing and classification, indexing, acquisitions and robotics in library activities. This means that artificial intelligence played a high level of roles in the delivery of libraries goods and services to the users in higher institutions in Nigeria.

Table 2   Perceived Benefits of Artificial Intelligence to Library Services in Academic Libraries in Kwara state Nigeria.

Statement	SA		A		D		SD		Mean	STD
	N	%	N	%	N	%	N	%	$\bar{x}$	δ
The application of AI in academic libraries also helps to eliminate repetitive and tedious tasks	100	90.1	11	9.9	0	0	0	0	3.31	0.9
Library services can be done in more effective and efficient ways for improved user satisfaction	93	83.8	18	16.2	0	0	0	0	3.22	0.8
The use of AI academic libraries will help to analyze big data, create metadata, and improve search translation.	81	73	30	27	0	0	0	0	3.17	0.9
The adoption and use of AI have improved user engagement in many developed countries in the world.	90	81.1	21	18.9	0	0	0	0	3.6	0.9
AI technologies can be used to improve library services	101	91	10	9	0	0	0	0	3.7	0.9
AI technologies can assist library users on how they can locate library materials through intelligent tutoring system and automated library services.	90	81.1	21	18.9	0	0	0	0	3.8	0.9
Adoption of AI can provide better services to researchers and other library users	101	91	10	9	0	0	0	0	3.6	0.9

Table 2 shows the perceived benefits of artificial intelligence to library services in academic library services in academic libraries where the application of AI in academic libraries helps to eliminate repetitive and tedious task had the highest mean value of 3.3; it helps to make library services more effective and efficient to improve user satisfaction with mean value 3.22 the use of AI also help to analyze big data, create metadata, and improve search translation with mean value of 3.17; the adoption of AI improve user engagement mean value of 3.6; the use of AI technologies improve library services mean value 3.7; the use of AI technologies help to assist library users on how they can locate library materials through intelligent tutoring system and automated library services and the adoption of AI can provide better services to researchers and other library users had the least mean value of 3.8 and 3.6 respectively

This implies that AI is beneficial to academic libraries for effective library services and operations because it helps to eliminate repetitive and tedious task; it helps to make library services more effective and efficient to improve user satisfaction; the adoption of AI improve user engagement; and help to assist library users on how they can locate library materials through intelligent tutoring system and automated library services and the adoption of AI can provide better services to researchers and other library users.

Table 3 **Perceived Challenges facing the Adoption of AI in Academic Libraries in Kwara state, Nigeria**

Statement	SA		A		D		SD	
	N	%	N	%	N	%	N	%
Absence of technical know-how to use and run artificial intelligence systems among the library staff	93	83.8	18	16.2	0	0	0	0
Inconsistent power supply to power artificial intelligence systems in libraries	103	92.8	8	7.2	0	0	0	0
Limited budget to procure the technology, and training personnel that will be in charge of the system maintenance	101	91	10	9	0	0	0	0
Limited academic libraries in Nigeria are ready to integrate the AI system into their operations and services due to poor automation.	106	95.5	5	4.5	0	0	0	0
There is lack sophisticated ICT infrastructure to meet up with the current global practices.	90	81.1	13	11.7	8	7.2	0	0
Huge system development and maintenance cost of artificial intelligence systems in libraries	93	83.8	18	16.2	0	0	0	0

Key: Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD)

Table 3 shows the perceived challenges facing the adoption of AI in academic libraries in Kwara state, Nigeria. The challenges encountered include Absence of technical know-how to use and run artificial intelligence systems among the library staff; inconsistent power supply to power artificial intelligence systems in libraries; limited budget to procure the technology, and training personnel that will be in charge of the system maintenance; limited academic libraries in Nigeria are ready to integrate the AI system into their operations and services due to poor automation; lack of sophisticated ICT infrastructure to meet up with the current global practices and huge system development and maintenance cost of artificial intelligence systems in libraries.

Discussion of Finding

The results demonstrated the significant responsibilities artificial intelligence played in providing library services in Nigeria's higher education institutions. The views expressed by the respondents align with those of Asemi et al. (2018) and Mogali (2015), who identified several high-level roles that artificial intelligence played in libraries in Nigerian higher education institutions. These roles included applications of expert systems in reference services, cataloguing, classification, indexing, acquisition, application of natural language processing in library activities, application of pattern recognition in library activities, and application of robotics in library activities.

These results are consistent with Saibakumo's (2021) report, which lists the difficulties academic libraries face in integrating AI systems into their operations and services: unstable power supplies, inadequate technology infrastructure, a lack of technical expertise, a negative attitude toward advanced automation, the use of inappropriate library software, and technophobia. The results also support the findings of Wheatley and Hervieux (2019), who stated that academic libraries face difficulties related to skill mismatches and a lack of appropriate abilities.

Summary of the major Findings

The following are the summary of the major findings:

1. The findings revealed that most of the library staff are of the view that artificial intelligence could be applied in references section, cataloguing and classification, indexing, acquisitions and robotics in library activities

2. The study also revealed that AI is beneficial to academic libraries for effective library services and operations because it helps to eliminate repetitive and tedious task; it helps to make library services more effective and efficient to improve user satisfaction; the adoption of AI improve user engagement; and help to assist library users on how they can locate library materials through intelligent tutoring system and automated library services and the adoption of AI can provide better services to researchers and other library users.

3. It was revealed from the findings that academic libraries in Nigeria are not ready for the integration of AI systems in library operations and services; libraries are under-equipped with ICT facilities which is an integral part of AI to function; academic library employees have a negative attitude toward using ICT to perform library services so bring AI is not an option for now; among others.

Conclusion

The study examined the perception of academic librarians on the awareness and readiness of academic libraries to integrate AI for library operations and services in Nigeria. The findings reveal that most the librarians are aware of the integration of AI in academic libraries and that level of awareness is high. The general perceptions of librarians on the integration of AI systems are somewhat positive and its application in library operations and services can take the library to the next level by reducing human errors due to the repetitiveness in the library operations and services.

Recommendations

Based on the findings in this study, the following are therefore recommended.

1. It is recommended that there should be an improved budget for library automation, procuring the technology, and training library personnel.

2. There is a need for adequate funding for academic libraries in Nigeria. The funding should be directly from the government or the parent institutions of the academic libraries to guide against the mismanagement of funds

3. The issue of power which is one of the challenges typical of developing countries when it comes to the adoption of technologies should be properly dealt with. This can be done by making alternative power generating sets available. Academic libraries in Nigeria can think of alternative solutions like solar power, bio-fuel for generating power, or the like.

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