



# AWARENESS AND ADOPTION OF ARTIFICIAL INTELLIGENCE FOR EFFECTIVE LIBRARY SERVICE DELIVERY IN ACADEMIC LIBRARIES IN FEDERAL POLYTECHNICS IN SOUTH WESTERN 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 federal polytechnics in south western Nigeria. This study adopts the survey design. The population of the study consists of 154 library staff in the 6 federal polytechnics located in Southwestern Nigeria. The study was limited to four (4) federal polytechnics in Southwestern Nigeria. This includes Yaba College of Technology, Federal Polytechnic Ilaro, Federal Polytechnic Ado and Federal Polytechnic Ede. The sample size is therefore 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. The data collected in this study were analysed using Statistical Product for Service Solutions (SPSS). The findings of the study revealed that serials, catalogue, circulation, and users' registration in the library had the highest percentages of usage. Also, it was 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. 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

The capacity to reason, acquire knowledge, learn information and skills, and then put them to use when necessary is known as intelligence. Many people have been intrigued by the idea of creating computers or other robots that behave and learn like humans. Humans are born with the capacity to see, reason, and act, and this capacity evolves and improves over time as a result of a wide range of variables.

The use of Artificial Intelligence in library systems includes descriptive cataloging, subject indexing, reference services, technical services, shelf reading, collection development, information retrieval system, etc. Tella (2020) emphasized that, in contrast to libraries in developing nations, which are still struggling to finding their feet, developed countries have embraced and used AI technologies practically in every aspect of their lives.

Since Corke (2013) predicted that artificially intelligent systems (robots) will play a significant role in technology in the twenty-first century, it is necessary to investigate this technology, as well as its benefits and drawbacks, in order to fully capitalize on its wealth of advantages for the delivery of innovative and optimal services in libraries. In a nutshell, the main argument for using artificial intelligence in libraries is that they are less likely to make mistakes than people and can work nonstop for a full seven days without getting weary, freeing up librarians to perform other tasks. In the end, processing library materials will be done quickly, efficiently, and effectively thanks to computers' ability to work at scales and speeds that are beyond those of humans, improving library services delivery at every level. Laboratories, teachers' classrooms, equipment, and libraries with a wealth of diverse information resources that can assist teaching, learning, and research projects are the four main infrastructures of higher education institutions (Tiemo & Ateboh, 2016). Libraries serve as the hub of an educational establishment and a place where information is made available to all visitors, regardless of their ages, political and ethical perspectives, religion, sex, etc. Moving information resources from book collections to audiotape collections, video collections, databases, digitizing information resources, automating libraries, and now implementing artificial intelligence in library operations (Vijayakumar & Vijan, 2011).

Library is the nerve centre of any higher institution of learning. The strength and weakness of any institution is measured by the operations, services as well as visibility of the library both locally and internationally. The advent of Corona Virus in 2019/2020 has made many libraries to look inward on how to improve library operations and services, which made way for the use of AI to library services. Anecdotal evidences have shown that the most library staff are unaware of the use of AI into library services. Also, some have the phobia of information and communication technology (ICT) and also the fear of losing their jobs to robots if adopted in the library. The level of adoption of ICT to library services and operation is equally low let alone the use of AI which is more costly and required expertise to operate.

Presently, University of Lagos is the only institution in Nigeria that has introduced the use of AI to some of its library services and operations. The level of awareness among library professional on the use of AI for library services and operations is low, therefore the study tends to look at the awareness and adoption of AI for effective library services delivery in academic libraries in Southwestern Nigeria.

### **Objectives of the Study**

The general objective of this study is to investigate the awareness and adoption of artificial intelligence for effective library services delivery academic libraries in Federal Polytechnic in Southwestern Nigeria.

The specific objectives are to:

1. find out the available library services in academic libraries in Federal Polytechnics in Southwest Nigeria;
2. examine the areas artificial intelligence can be applied in academic libraries in Federal Polytechnics in Southwest Nigeria;
3. identify the perceived benefits of artificial intelligence to library operations and services in academic libraries in Federal polytechnics in southwestern Nigeria;
4. examine the library staff level of awareness on adoption of artificial intelligence to library operations and services in academic libraries in Federal polytechnics in Southwestern Nigeria;

### Research Questions

The following research questions guided the study:

1. What are the available library services in academic libraries in Federal Polytechnics in Southwest Nigeria?
2. What are the areas artificial intelligence can be applied in the Federal Polytechnics library in Southwest Nigeria?
3. What are the perceived benefits of artificial intelligence to library services in academic libraries in Federal polytechnics in southwestern Nigeria?
4. What is the library staff level of awareness on adoption of artificial intelligence to library operations and services in academic libraries in Federal polytechnics in Southwestern Nigeria?

### Literature Review

According to Adeoye and Popoola (2011), the concept of librarianship is predicated on providing users with pertinent resources in addition to providing 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 the services it offers are a good way to gauge how good an academic is at performing 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 intelligent systems that mimic the functions of human intelligence and advance the study of human intelligence Liu (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 accessible massive informational collections, artificial intelligence is important to libraries (ALA, 2019). Artificial intelligence is the cutting-edge technology, according to Sridevi and Shanmugam (2017), utilized to administer the digital library. The development of computer systems or machines that think, behave, and actually challenge human intelligence is the ultimate promise of artificial intelligence, and this has obvious significant consequences for the field of librarianship. Artificial intelligence, which mimics how humans perceive and process information, is more than just an intelligent system or software program (Sridevi & Shanmugam, 2017). In order to offer knowledge-based services to library patrons and employees, intelligent library automation systems rely on artificial intelligence technologies.

All libraries, regardless of the type, carry out both frequent and infrequent basic operations and activities. Additionally, these procedures—which are carried out regularly—are frequently connected to the services the library offers. The basic duties of many libraries, according to Bharat (2015), 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 have the ability to 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, in an effort 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 has 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

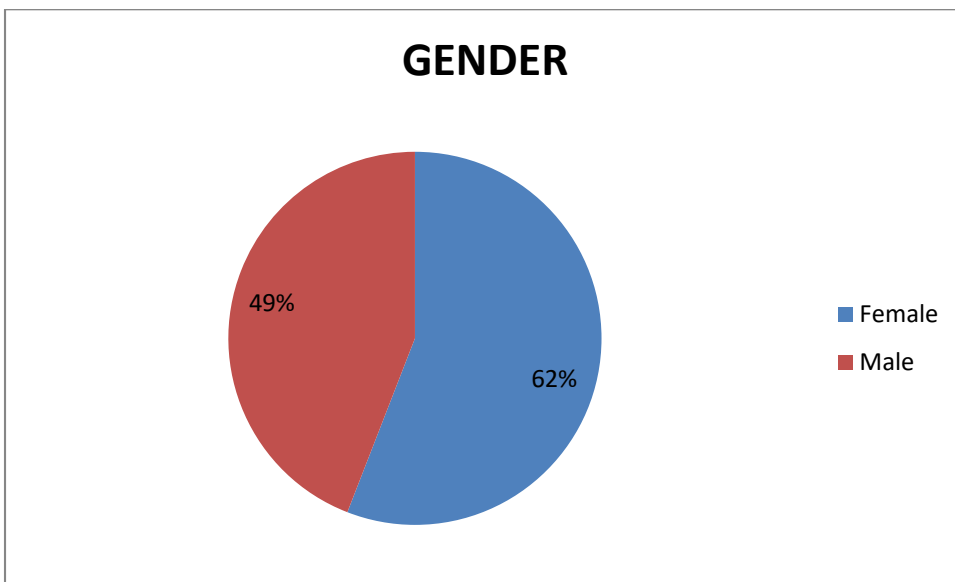
This study adopts the survey design. The population of the study consists of 154 library staff in the 6 federal polytechnics located in Southwestern Nigeria. The study was limited to four (4) federal polytechnics in Southwestern Nigeria. This includes Yaba College of Technology, Federal Polytechnic Ilaro, Federal Polytechnic Ado and Federal Polytechnic Ede. The sample size is therefore 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. The data collected in this study were analysed using Statistical Product for Service Solutions (SPSS).

## RESULTS AND DISCUSSION

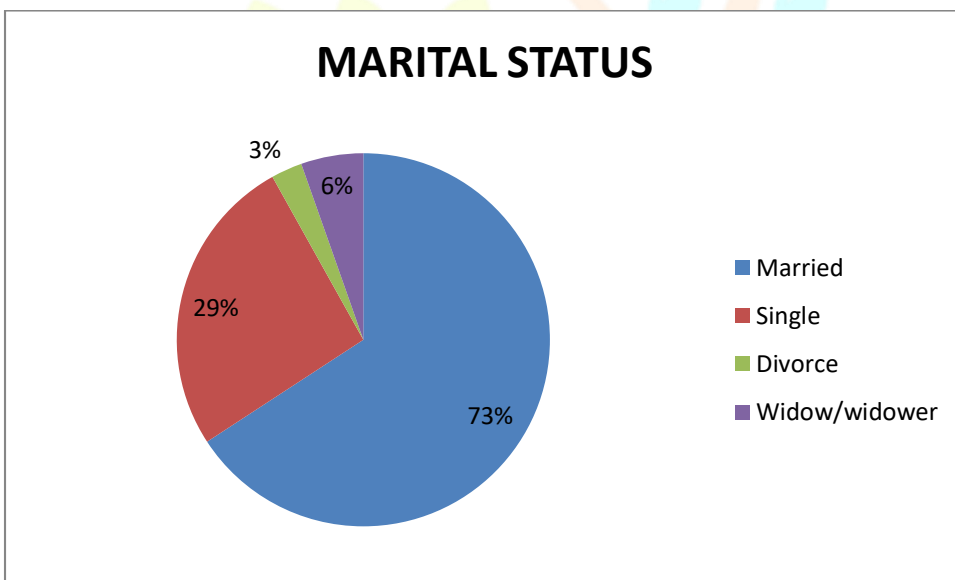
### Socio-demographic Characteristics of the Respondents

Characteristics	Categories	Frequency	Percentage (%)
<b>Gender</b>	Female	62	55.9%
	Male	49	44.1%
<b>Marital Status</b>	Married	73	65.8%
	Single	29	26.1%
	Divorce	3	2.7%
	Widow/widower	6	5.4%
<b>Age (in years)</b>	20 – 25 years	3	2.7%
	26 – 30 years	20	18.0%
	31 – 35 years	17	15.3%
	36 – 40 years	29	26.2%
	41 – 45 years	22	19.8%
	46 and above	20	18%

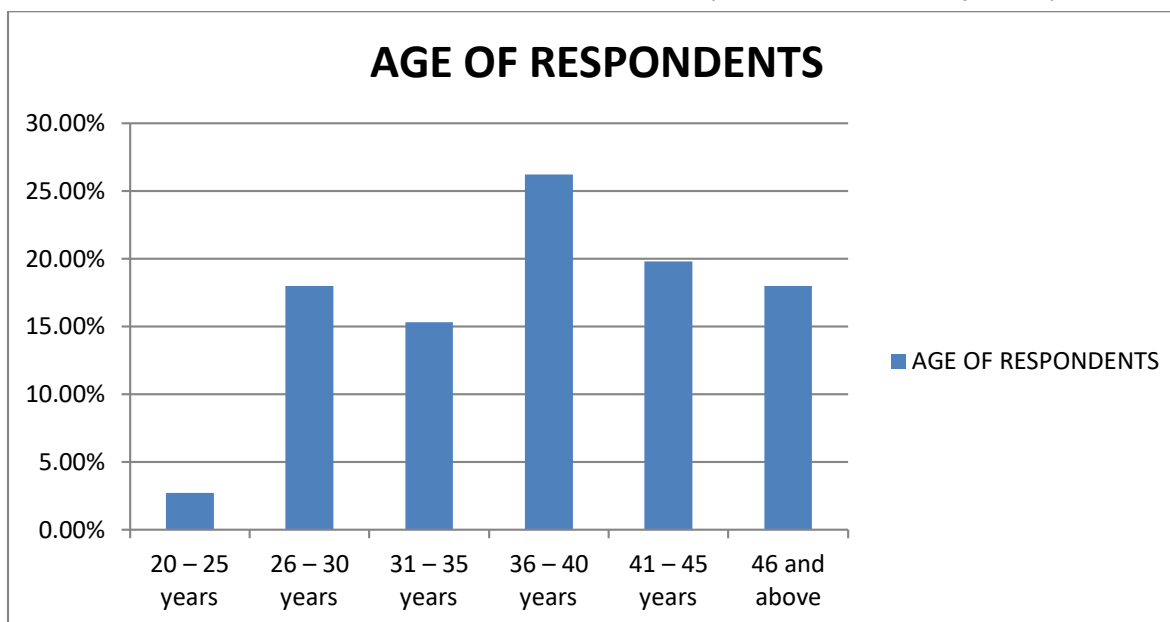
Source: Field Survey, 2023.



The information contained in Table 4.1 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 Southwest 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.

**Research Question One: What are the Available Library Services in Academic Libraries in Federal Polytechnics Library in Southwest Nigeria?**

**Table 4.2.1 Available Library Services in Academic Libraries in Federal Polytechnics**

Items	Freq.	% of	Freq. of	% of
	of Yes	Yes	No	No
Reference service	67	65.0	36	35.0
Users orientation services	51	49.5	52	50.5
Computer/internet services	56	54.4	47	45.6
Reprographic services	41	39.8	62	60.2
Loan services	59	57.3	44	42.7
Bibliographic services	68	66.0	35	34.0
Staff assistance services	57	55.3	46	44.7
Serial services	73	70.9	30	29.1
Bindery services	58	56.3	45	43.7
Disability support services	15	14.6	88	85.4
Catalogue and classification services	83	80.6	20	19.4
Circulation services	80	77.7	23	22.3
Users registration	90	87.4	13	12.6
Current awareness services	47	45.6	56	54.4

Book reserve services	54	52.4	49	47.6
Recreation services	20	19.4	83	80.6
Research assistance services	56	54.4	47	45.6
Open and closed access services	59	57.3	44	42.7
Preservation and conservation services	54	52.4	49	47.6
Interlibrary loan services	17	16.5	86	83

The data presented in Table 4.2.1 shows the available library services in academic libraries in Federal Polytechnics in Southwest Nigeria. It was revealed that serials, catalogue, circulation, and users' registration in the library had the highest percentages, which indicates that they are highly used. Bibliographic and reference services are moderately used while computer/internet services, loan services, staff assistance services, bindery services, book reserve, open and closed access service, preservation, and conservation are moderately used. On the other hand, Reprographic and Current awareness services are fairly used.

### Discussion of the Finding

The findings was in collaboration with the submission of Madukoma (2015) who identified the available library services to include loan services, interlibrary cooperation services, reference services (both digital and print), photocopies, CD-ROM search, bibliographical services, binding, printing, internet services, lamination, and readers' advisory services, among others. Also, Umunnakwe and Onyebinama (2007) examined the essential services to be readily available to include circulation, cataloguing, abstracting, reference, and indexing services.

### Research Question Two: What are the Areas Artificial Intelligence can be Applied in the Federal Polytechnics library in Southwest Nigeria?

Table 4.2.2 Areas artificial intelligence can be applied in academic libraries

Statement	SA		A		D		SD		$\bar{x}$	$\delta$
	N	%	N	%	N	%	N	%		
Application of Expert Systems in Reference Service	100		11		0	0	0	0	3.31	0.81
Application of Expert System in Cataloguing	93		18		0	0	0	0	3.22	0.75
Application of Expert System in Classification	81		30		0	0	0	0	3.17	0.73
Application of Expert System in Indexing	90		21		0	0	0	0	3.20	0.74
Application of Expert System in Acquisition	101		10		0	0	0	0	3.17	0.73
Application of Natural Language Processing in Library Activities	16		24		41		30		2.48	0.86
Application of Pattern Recognition in Library Activities	24		16		30	0	41	0	2.56	1.09
Application of Robotics in the Library Activities	100		11		0	0	0	0	3.22	0.86

Researchers' Field Survey 2023

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

The criteria mean =2.50 that is  $4+3+2+1=10 \div 4 = 2.5$ . This implies that any score less than 2.5 is considered low.

Table 4.2.2 presented the result of the areas artificial intelligence could be applied in academic libraries in Federal Polytechnics in Southwest 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.

### Discussion of Finding

The findings showed that there was high level of roles played by artificial intelligence in delivering libraries' services in higher institutions in Nigeria. The opinions of the respondents are in agreement with Asemi, et al (2018) and Mogali (2015) who saw Applications of Expert Systems in Reference Service, Application of Expert System in Cataloguing, Application of Expert System in Classification, Application of Expert System in Indexing, Application of Expert System in Acquisition, Application of Natural Language Processing in Library Activities, Application of Pattern Recognition in Library Activities and Application of Robotics in the Library Activities as high level of roles played by artificial intelligence in libraries in higher institutions in Nigeria.

### Research Question Three: What are the Perceived Benefits of Artificial Intelligence to Library Services in Academic Libraries in Federal Polytechnics in Southwestern Nigeria?

Table 4.2.3 Perceived Benefits of Artificial Intelligence to Library Services in Academic Libraries in Federal Polytechnics

Statement	SA		A		D		SD		Mean $\bar{x}$	STD $\delta$
	N	%	N	%	N	%	N	%		
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 4.2.3 shows the perceived benefits of artificial intelligence to 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

**Research Question Four: What is the Library Staff level of Awareness on Adoption of Artificial Intelligence to Library Operations and Services in Academic Libraries in Federal polytechnics in Southwestern Nigeria?**

Table 4.2.4 Library Staff Level of Awareness on Adoption of Artificial Intelligence to Library Operations and Services in Academic Libraries In Federal Polytechnics

Statement	SA		A		D		SD	
	N	%	N	%	N	%	N	%
I am aware of the integration of AI on library operations and services	100	90.1	11	9.9	0	0	0	0
I have heard about it in seminars, workshops and many training programs	93	83.8	18	16.2	0	0	0	0
I know that some libraries have already adopted the technology in their operations and services	24	21.6	16	14.4	30	27.2	41	36.9

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

**Source:** Researcher's Filed Survey 2023

The result in Table 4.2.4 the level of library staff of awareness on adoption of Artificial Intelligence to library operation and services in academic libraries in Federal polytechnics in southwestern Nigeria revealed that library staff in federal polytechnics in southwestern are aware of the integration of AI on library operations and services with 90.1% followed by hearing about AI in seminars, workshops and training programs with 83.8%. Meanwhile, 36.9% of the respondents disagree that majority of the libraries have adopted the use of AI to the library services.

### Discussion of Finding

The results above imply that the academic librarians in this study are aware of the integration of AI systems in library operations and services and it has become a fact that it is being adopted and used in some academic libraries around the globe except in the content of Nigerian academic library settings. This result aligns with submission of Panda and Chakravarty (2021) who noted that with various ICT applications in library, library staff would be able to shift their focus and attention to the application of AI systems into library operations and services.

### Summary of the major Findings

The following are the summary of the major findings:

1. It was revealed that serials, catalogue, circulation, and users' registration in the library had the highest percentages, which indicates that they are highly used. Bibliographic and reference services are moderately used while computer/internet services, loan services, staff assistance services, bindery services, book reserve, open and closed access service, preservation, and conservation are moderately used.
2. 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
3. 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.

4. The study revealed that academic librarians are aware of the integration of AI systems in library operations and services and it has become a fact that it is being adopted and used in some academic libraries around the globe except in the content of Nigerian academic library settings

## 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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