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## ASSESSING THE IMPACT OF ARTIFICIAL INTELLIGENCE PREDICTIVE ANALYTICS ON LIBRARY MANAGEMENT AT ABDULLAHI FODIYO UNIVERSITY, ALIERO, KEBBI STATE

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### Abstract

*This study assesses the impact of Artificial Intelligence (AI) predictive analytics on library management at Abdullahi Fodiyo University, Aliero, Nigeria. Adopting a descriptive analytical approach, the research surveyed 231 librarians from seven federal universities in North-Western Nigeria to evaluate the perceived influence of four key AI applications: AI-enabled cataloging and classification, automated resource management, AI-based user support systems, and predictive analytics in digital archiving. Data were analyzed using descriptive statistics (mean and standard deviation), with a criterion mean of 2.50 determining impact. Findings indicate a generally positive perception, with grand means of 2.70, 2.73, 2.55, and 2.65 for the respective applications, confirming their beneficial impact on operational efficiency, decision-making, and user satisfaction. However, results also reveal specific challenges, including inadequate staff training, inconsistent infrastructure, and underperformance in areas like automated workload reduction and advanced forecasting. The study concludes that while AI predictive analytics presents a transformative pathway for modernizing library services and bridging operational gaps in Nigerian universities, its full potential remains constrained by contextual and institutional barriers. It recommends strategic investment in AI infrastructure, the development of a supportive regulatory framework by national bodies like the NUC, and comprehensive, continuous capacity-building programs for library personnel to ensure sustainable integration and maximize the benefits of data-driven library management.*

**Keywords:** Artificial Intelligence, Predictive Analytics, Library Management, Abdullahi Fodiyo University, Information Systems.

## Introduction

Management is the systematic coordination of resources, personnel, and processes to achieve organizational objectives effectively and efficiently. This involves core functions planning, organizing, leading, and controlling to align tasks with strategic goals within resource constraints. Contemporary management theory emphasizes adaptability, innovation, and data-informed decision-making to ensure sustainability and resilience in dynamic environments (Drucker & Maciariello, 2020; Mintzberg, 2019).

University libraries serve as critical knowledge infrastructures within academic institutions, supporting teaching, learning, and research. Their effective management requires strategies for acquiring, organizing, preserving, and disseminating information resources through cataloging, user services, and digital initiatives (Husain & Nazim, 2016). In the digital era, however, traditional library management in Nigeria faces significant challenges, including resource limitations, escalating user expectations, and the proliferation of digital information (Omosekejimi & Blessing, 2019). Federal universities in North-Western Nigeria are particularly constrained in meeting service demands, creating a pressing need for innovative solutions.

Artificial Intelligence (AI) the simulation of human intelligence processes by machines—encompasses machine learning, natural language processing, and data analytics. It represents a transformative force for library management, offering tools for intelligent cataloging, automated resource management, real-time user support, and predictive analytics. These applications promise enhanced operational efficiency, cost reduction, and personalized user experiences (Russell & Norvig, 2020). Globally, AI adoption in libraries has demonstrated tangible benefits, such as improved resource discoverability through automated cataloging and 24/7 user assistance via chatbots (Smith & Anderson, 2018).

In the Nigerian context, AI presents a viable pathway to modernize library services and bridge existing operational gaps. A key application is Predictive Analytics, which utilizes AI models to forecast trends, anticipate user needs, and optimize digital archiving and resource allocation (Khan et al., 2019). This is

particularly relevant for challenges like preserving deteriorating physical collections and making data-driven acquisition decisions. For libraries such as the Abdullahi Fodiyo University Library, which grapple with manual processes and limited resources, AI-driven predictive analytics offers a strategic tool to enhance cataloging, resource management, and overall user satisfaction. However, the extent of its adoption and measurable impact on library performance in this setting remains underexplored. This study, therefore, seeks to assess the impact of AI predictive analytics on the management of this specific library, serving as a model for potential regional innovation.

## Statement of the Problem

Libraries serve as foundational pillars for academic and research endeavours, providing essential access to information resources, facilitating knowledge acquisition, and underpinning scholarly pursuits. Their efficacy in fulfilling this mandate, however, is increasingly strained by accelerating technological change and escalating user expectations. Within Nigeria's federal universities in the North-Western states, libraries confront pronounced operational deficiencies, including antiquated cataloging systems, inefficient resource management, absent real-time user support, and inadequate digital archiving. These systemic issues are compounded by chronic underfunding, infrastructural deficits, and a scarcity of technical expertise, collectively hindering service delivery and user satisfaction.

Globally, Artificial Intelligence (AI) has proven transformative for library management, yet its adoption within Nigeria remains nascent. AI applications such as intelligent cataloging, automated resource management, AI-driven user support, and predictive analytics possess demonstrable potential to redress these inefficiencies by streamlining operations, reducing costs, and enhancing service quality. However, the specific impact and applicability of these technologies within the unique socio-institutional context of North-Western Nigeria are inadequately researched. Without targeted investigation and strategic implementation, libraries in this region risk exacerbating existing

service gaps, with detrimental consequences for academic and research outcomes.

Consequently, the core problem addressed by this study is the persistent operational inefficiency within library management systems at federal universities in Nigeria's North-Western states, which compromises their capacity to support academic excellence. This inefficiency is fundamentally linked to the limited integration of proven AI-driven solutions. This research therefore aims to investigate the impact of specific AI technologies namely, AI-enabled cataloging and classification, automated resource management, AI-based user support systems, and predictive analytics in digital archiving on library management. The findings are critical for developing evidence-based strategies to modernize services and align them with contemporary global standards.

### Objectives of the Study:

The general objective of this study is to investigate the impact of various Artificial Intelligence (AI) applications on the management of Federal Universities Libraries in North Western State, Nigeria. Specifically, the study aims to:

1. Assess the impact of AI-powered Cataloging and Classification systems on the management of Federal Universities Libraries in North Western State, Nigeria.
2. Evaluate the impact of AI-based Automated Resource Management on the management of Federal Universities Libraries in North Western State, Nigeria.
3. Analyze the impact of AI-driven User Support Systems on the Management of Federal Universities Libraries in North Western State, Nigeria.
4. Determine the impact of AI-Predictive Analytics on the management of Federal Universities Libraries in North Western State, Nigeria.

### Research Questions

The following research questions guided the study:

1. What is the impact of Artificial Intelligence Cataloging and Classification on

management of Federal Universities Libraries in North Western State, Nigeria?

2. What is the impact of Artificial Intelligence Automated Resource Management on management of Federal Universities Libraries in North Western State, Nigeria?
3. What is the impact of Artificial Intelligence User Support Systems on management of Federal Universities Libraries in North Western State, Nigeria?
4. What is the impact of Artificial Intelligence Predictive Analytics on management of Federal Universities Libraries in North Western State, Nigeria?

### Literature review

Artificial intelligence refers to computer systems capable of performing tasks that normally require human intelligence. Predictive analytics refers to the application of statistical methods, machine learning algorithms, and data mining techniques to analyze historical and current data to make predictions about future events or behaviors. It uses patterns found in data to identify trends, foresee risks, and inform decision-making processes. This method involves data collection, preprocessing, modeling, and analysis to derive actionable insights that can guide strategies across various domains (Chen et al., 2018). The effectiveness of predictive analytics lies in its ability to provide foresight, enabling organizations to anticipate and prepare for future scenarios, which enhances operational efficiency and competitiveness (Smith & Lee, 2019). As a tool, predictive analytics is widely employed in areas such as finance, healthcare, education, and resource management, where understanding future possibilities is critical (Jones & Patel, 2021).

In university libraries, predictive analytics offers transformative potential by enabling proactive and informed management practices. Libraries accumulate vast amounts of data, including circulation statistics, user demographics, and search patterns, which serve as a rich foundation for predictive analysis (Zhao & Wang, 2020). By leveraging these datasets, libraries can forecast user needs, optimize resource allocation, and tailor services to meet evolving demands (Ahmed et al., 2019). For instance, predictive models can analyze borrowing trends to identify which materials are likely to be in high demand during specific periods, allowing for

strategic acquisition and availability planning (Kumar & Sharma, 2022). One significant application of predictive analytics in university libraries is improving collection development. By analyzing usage data and user preferences, libraries can identify gaps in their collections and prioritize the acquisition of high-demand or emerging resources (Nguyen et al., 2021). This approach ensures that the library's offerings remain relevant and valuable to its user base, enhancing satisfaction and academic support (Hernandez & Yu, 2022).

Predictive analytics also enhances operational efficiency in university libraries by optimizing staff allocation and service hours. By understanding peak usage times and service demands, library managers can allocate personnel and resources more effectively, minimizing downtime and maximizing user satisfaction (Mukhopadhyay et al., 2022). Moreover, predictive tools can aid in space management by analyzing foot traffic and identifying areas of high congestion or underutilization, thereby guiding redesign and optimization efforts (Rahman & Aziz, 2021). In the realm of user engagement, predictive analytics enables personalized services that align with individual user behaviors and preferences. For example, recommendation engines powered by predictive models can suggest books, articles, or events based on a user's past interactions, fostering deeper engagement and resource utilization (Li & Zhang, 2021). Similarly, predictive analytics can identify at-risk users, such as students who have not utilized library services in a prolonged period, enabling libraries to intervene and encourage participation (Smith et al., 2019).

Despite its advantages, the implementation of predictive analytics in university libraries presents challenges, including data privacy concerns, the need for significant technological investment, and the potential for bias in algorithmic predictions (Chen & Zhang, 2020). Libraries must adopt ethical practices and robust governance frameworks to address these issues while ensuring that predictive tools complement rather than replace human judgment (Jones & Patel, 2020). Training library staff in data literacy and predictive analytics techniques is also crucial for maximizing the value of these tools (Khan et al., 2020).

In conclusion, predictive analytics is a powerful tool for running university libraries. It can help

managers make decisions ahead of time, get more people to use the library, and make the best use of resources. By effectively integrating predictive analytics into their operations, university libraries can better meet the needs of their communities and adapt to the dynamic landscape of higher education. Predictive analytics can anticipate user needs, automate cataloging, and guide acquisition decisions. At Abdullahi Fodiyo University Library, predictive analytics can support decision-making by analyzing borrowing trends, optimizing collection development, and improving service delivery. However, its implementation depends largely on institutional support, infrastructure, and the technical

### Theoretical Framework

The paper is anchored on Henri Fayol's Management Theory

#### Henri Fayol's Management Theory

Henri Fayol, a French mining engineer and management theorist, is widely regarded as one of the founders of modern management theory. His work, developed in the early 20th century, laid the foundation for classical management principles. Fayol's management theory, often called **Administrative Theory**, focuses on the functions and principles of management, providing a systematic framework for effective organizational administration. Fayol identified five primary functions of management: planning, organizing, commanding, controlling, coordinating.

In addition, Fayol proposed 14 principles of management, which include concepts such as division of work, authority and responsibility, unity of command, unity of direction, centralization, scalar chain (hierarchy), discipline, equity, and esprit de corps (team spirit). These principles emphasize clarity of roles, effective communication, and balanced authority within an organization. Fayol's theory is fundamentally top-down and administrative, focusing on managerial roles and responsibilities rather than worker-level tasks. It provides a clear, structured approach to managing organizations, which remains influential in modern management practice, including in areas such as library management where planning, organizing resources, leading staff, and controlling operations are critical. His work

underscores the importance of systematic management and has shaped how organizations are structured and led, emphasizing efficiency, order, and discipline in organizational processes. Fayol's theory remains relevant today, particularly in hierarchical and bureaucratic organizations seeking clear management frameworks.

Henri Fayol's Management Theory is related to the management of university libraries as it provides a structured framework for organizing and directing library operations effectively. The five functions of management: planning, organizing, commanding, coordinating, and controlling are essential in ensuring that library resources, staff, and services are efficiently aligned to meet the academic and research needs of the university community.

### Methodology

The paper adopts a descriptive analytical approach, drawing insights from related empirical studies, library records, and observations. Information was gathered from staff and users of Abdullahi Fodiyo University Library to assess awareness, level of adoption, and perceived impact of AI predictive analytics. The population of the study consist of two hundred and thirty one 231 Librarians, (Federal University Gussau Library 12, Federal University Birnin Kebbi Library 16, Federal University Dutse Library 47, Abdullahi Fodio Library 7, Kashim Ibrahim Library, Zaria 96, Bayero University Kano Library 43 and Federal University Dutsin-ma Library 10 drawn from Ninety (7) Federal universities in North-Western States, Nigeria. This study adopted total population, which is a specialized form of purposive sampling strategy. According to Sekaran and Bougie (2013), total population sampling involves the inclusion of every member of a population that exhibits a particular set of predefined and relevant characteristics. In this regard, the total population consisted 231 librarians from Ninety (7) Federal universities in North-Western States, Nigeria. The choice to include all librarians is based on their specialized and context-specific knowledge,

which is directly relevant to the study's objective. These librarians possess distinctive characteristics that make their perspectives essential to the study. The adoption of total population as sample which discourages the use of sampling technique and the reason for using total population is because of the manageable size of the population.

The researcher constructed instrument titled: "Impact of Artificial Intelligence on Management Questionnaire" (IAIMQ) which will be served to the 231 Librarians to assess the impact of Artificial intelligence on the management of Federal Universities Libraries in North Western States, Nigeria. The instrument consists of two sections; Section A and B. Section A consists of demographic data of the respondents while section B consist of continuous variables scales from the sub-independent variables such AI-Enabled Cataloging and Classification, Automated Resource Management, AI-Based User Support Systems, Predictive Analytics and Digital Archiving using a four-point rating scale. The data collated analyzed using descriptive statistics of mean and standard deviation to answer the research questions. The criterion mean score of 2.50 and above will be agreed as having impact and the criterion mean score below 2.50 will be disagreed as having no impact while chi-square will be used to test the null hypotheses at 0.05 level of significance. All these will be computed using statistical package for social sciences (SPSS) version 21.

### Results

The results of the data analysis are presented according to the research questions and hypotheses formulated for the study. Data related to each research question and hypotheses are presented on a separate table to aid comprehension of the analysis and interpretation of results. The decision rule was that null hypotheses were rejected if the P-value was less than 0.05 and upheld if otherwise. A total of 231 questionnaires were administered to the respondents among which 221 were returned and 10 were not returned.

**Research questions 1:** What is the impact of Artificial Intelligence Cataloging and Classification on management of Federal Universities Libraries in North Western State, Nigeria?

**TABLE 1: Mean and Standard Deviation Ratings on the Impact of Artificial Intelligence Cataloging and Classification on Management of Federal Universities Libraries in North Western State, Nigeria**

S/N	Item	N	Mean	Std. Dev.	Remark
1	Artificial Intelligence enabled systems improve the accuracy of subject classification of resources.	221	3.13	0.96	A
2	Artificial Intelligence automates the assignment of metadata to new materials, reducing manual workload.	221	2.65	0.91	A
3	AI assists in standardizing cataloging formats to ensure consistency across records.	221	2.48	0.94	D
4	AI-enabled classification enhances the retrieval speed of library resources for users.	221	2.34	1.07	D
5	AI helps identify correct duplicate erroneous catalog records efficiently.	221	2.62	1.07	A
6	AI tools facilitate easier updating maintenance of classification systems.	221	2.92	0.89	A
7	AI-enabled cataloging supports effective resource sharing/ inter-library collaboration	221	3.01	0.98	A
8	librarians receive adequate training to effectively utilize AI in cataloging and classification tasks.	221	2.46	0.98	D
	<b>Grand Mean</b>		2.70	0.98	A

Source: Field Report 2025

Table 1 shows a grand mean of 2.70 indicates that respondents generally agreed that Artificial Intelligence (AI) has a positive impact on cataloging and classification activities in the management of Federal University libraries in North-Western Nigeria. This suggests that AI tools are perceived to enhance accuracy, reduce manual workload, and improve collaboration among libraries, though there are moderate challenges in areas such as retrieval speed and librarian training. The standard deviation of 0.98

shows a moderate variation in responses, meaning that most respondents had similar perceptions regarding AI's contributions.

In summary, AI technologies are viewed as **beneficial** to library management, especially in automating repetitive cataloging tasks and improving data consistency, though further training and system improvements are needed for optimal implementation.

**Research Question 2:** What is the Impact of Artificial Intelligence Automated Resource Management on management of Federal Universities Libraries in North Western State, Nigeria?

**Table 2: Mean and Standard Deviation Ratings on the Impact of Artificial Intelligence Automated Resource Management on management of Federal Universities Libraries in North Western State, Nigeria**

S/N	Item	N	Mean	Std. Dev.	Remark
9	Automated Artificial Intelligence systems effectively track borrowing and return of resources.	221	2.69	1.07	A
10	Automated resource management helps optimize the acquisition of new materials based on user demand.	221	2.51	0.95	A
11	Automated systems provide timely correct inventory reports for decision-making.	221	2.63	0.96	A
12	Overdue reminders and notifications are efficiently handled by automated systems.	221	2.82	0.89	A
13	Automated resource allocation ensures equitable access to limited resources.	221	2.71	0.95	A
14	Artificial Intelligence powered recommendations assist in purchasing resources that align with users' needs.	221	2.58	1.06	A
15	Automated systems reduce the workload of librarians in managing resource circulation.	221	2.28	1.03	D
16	The integration of automated resource management improves overall user satisfaction.	221	2.59	1.06	A
	<b>Grand Mean</b>		2.73	1.00	A

**Source: Field Report 2025**

Table 2: Mean and Standard Deviation Ratings on the Impact of Artificial Intelligence Automated Resource Management on the Management of Federal Universities Libraries in North-Western Nigeria. The grand mean of 2.73 indicates that respondents generally agree that Artificial Intelligence based automated resource management systems have a positive impact on the management of Federal University libraries in North-Western Nigeria. Respondents acknowledged that AI automation improves resource tracking, inventory reporting, acquisition decisions, and user satisfaction. However, the relatively low mean for item 15

(2.28) suggests that the reduction of librarian workload through automation is less significant or inconsistently experienced across institutions. The standard deviation of 1.00 implies a moderate level of variation in responses, indicating that while most respondents share similar views, some differences exist based on institutional readiness and exposure to AI systems. AI-based resource management is perceived as beneficial, enhancing operational efficiency and decision-making accuracy in university libraries, though further system integration and staff training are needed for optimal performance.

**Research Question 3:** What is the Impact of Artificial Intelligence User Support Systems on Management of Federal Universities Libraries in North Western State, Nigeria?

**Table 3: Mean and Standard Deviation Ratings on the impact of Artificial Intelligence User Support Systems on management of Federal Universities Libraries in North Western State, Nigeria**

S/N	Item	N	Mean	Std. Dev.	Remark
17	AI-based virtual assistants efficiently provide real-time answers to user queries.	221	2.72	0.87	A
18	AI chatbots effectively guide users in locating library materials.	221	2.51	0.86	A
19	AI systems recommend relevant resources based on users' research interests.	221	2.41	0.96	D
20	AI platforms simplify the process of accessing digital archives.	221	2.52	1.04	A
21	AI platforms simplify the process of accessing digital archives.	221	2.59	0.81	A
22	AI tools help reduce the workload of librarians by handling routine inquiries.	221	2.44	0.83	D
23	AI-powered systems efficiently handle multilingual queries to support diverse user needs.	221	2.59	0.87	A
24	The implementation of AI-based user support systems improves the overall efficiency of library operations	221	2.65	1.06	A
	<b>Grand Mean</b>		2.55	0.91	A

**Source: Field Report 2025**

The grand mean of 2.55 indicates that respondents generally agree that Artificial Intelligence (AI) user support systems have a positive impact on the management of Federal University libraries in North-Western Nigeria. The findings reveal that AI-powered tools such as virtual assistants and chatbots enhance user interaction, improve access to digital resources, and facilitate timely responses to user queries. Items 17, 20, and 24 show relatively higher means, signifying that respondents recognize the role of AI in enhancing user satisfaction and operational efficiency.

However, the relatively lower means for items 19 (2.41) and 22 (2.44) indicate that AI recommendation systems and workload reduction for librarians are not yet fully effective

or widely implemented across the libraries studied.

The standard deviation of 0.91 suggests a moderate variation in responses, implying some differences in the level of AI adoption and effectiveness among the universities. General, the results imply that AI-based user support systems are positively transforming library services, but more investment in infrastructure, librarian training, and system integration is required to maximize their full potential.

**Research Question 4:** What is the Impact of Artificial Intelligence Predictive Analytics on management of Federal Universities Libraries in North Western State, Nigeria?

**Table 4: Mean and Standard Deviation Ratings on the impact of Artificial Intelligence Predictive Analytics on management of Federal Universities Libraries in North Western State, Nigeria**

S/N	Item	N	Mean	Std. Dev.	Remark
25	Predictive analytics effectively forecasts user demand for specific resources.	221	2.48	0.87	D
26	Predictive analytics aids in determining priority areas for resource acquisition.	221	2.70	0.95	A
27	Predictive analytics helps identify underutilized resources for better allocation.	221	2.51	0.96	A
28	Predictive analytics tools assist in planning for future infrastructure and space needs.	221	2.29	1.01	D
29	predictive analytics is used to identify patterns in borrowing / usage trends.	221	2.86	0.91	A
30	Predictive analytics supports the preservation of rare/fragile materials by prioritizing digital archiving	221	2.82	0.90	A
31	Predictive analytics improves decision-making by providing insights into emerging research topics.	221	2.72	0.89	A
32	predictive analytics ensures efficient resource distribution to meet user needs effectively.	221	2.78	0.95	A
	<b>Grand Mean</b>		2.65	0.93	A

**Source: Field Report 2025**

Table 4 shows the impact of Artificial Intelligence Predictive Analytics on management of Federal Universities Libraries in North Western State, Nigeria. The grand mean of 2.65 (Agree) indicates that respondents generally agreed that Artificial Intelligence Predictive Analytics has a positive impact on the management of Federal Universities' libraries in North-Western Nigeria. This suggests that predictive analytics tools are increasingly being utilized to support data-driven decision-making, resource allocation, digital preservation, and future planning within library management. The standard deviation of 0.93 implies that respondents' opinions were moderately consistent, showing a fair level of agreement among library staff regarding the beneficial impact of AI predictive analytics on library operations. AI predictive analytics significantly aids library management by improving forecasting, prioritization, and planning processes though some areas like infrastructure forecasting still need improvement.

## Findings and Discussion

### Impact of AI-Enabled Cataloging and Classification on Management of Federal Universities Libraries

This research hypothesis which addressed the impact of AI-Enabled Cataloging and Classification on management of Federal Universities Libraries revealed that there was a significant impact of AI-Enabled Cataloging and Classification on management of Federal Universities Libraries in North Western State, Nigeria. This result conforms Oluwaseun and Omolara (2022) whose study revealed that AI reduced manual labor and enhanced accuracy in cataloging. However, challenges included inconsistent power supply, limited funding, and a lack of skilled personnel. This result also agrees with Ahmed et al. (2020) investigated Metadata Augmentation Using NLP, Machine Learning, and AI Chatbots: A Comparison. Results showed that AI chatbots enhanced metadata management efficiency by reducing manual

labor and improving discoverability. However, challenges like conceptual inaccuracies and insufficient user training were observed. Also, in conformity with Smith and Lee (2019) who demonstrated that ChatGPT significantly reduced cataloging time while maintaining acceptable levels of accuracy, though human oversight remained critical. The study concluded that AI tools could augment but not entirely replace professional expertise in cataloging. AI-enabled cataloging and classification significantly enhance resource management, ensuring that vast and diverse collections are efficiently organized and easily retrievable (Kapoor & Sharma, 2021). University libraries often serve a large and varied audience, including students, researchers, and faculty members, all of whom require tailored access to specialized resources (Chen et al., 2019). AI-driven cataloging systems meet this demand by offering personalized recommendations, advanced search functionalities, and real-time updates to catalogs, improving user satisfaction and engagement (Bui & Pham, 2020).

#### **Impact of Automated Resource Management on Management of Federal Universities Libraries**

This research hypothesis which addressed the impact of Automated Resource Management on management of Federal Universities Libraries revealed that there was a significant impact of Automated Resource Management on management of Federal Universities Libraries in North Western State, Nigeria. This result conforms Afolabi (2022) who noted that automated resource management systems significantly improved resource acquisition, cataloging, and retrieval processes, reducing operational inefficiencies. However, challenges such as limited technical expertise and inadequate funding were highlighted. The result is also in agreement with Ahmed and Musa (2021) findings which indicated that automation improved resource organization and access, thereby enhancing user satisfaction. However, technical challenges, such as software incompatibility and frequent system downtimes, hindered optimal performance. The result is in consonant with Chen and Li (2020) in their study also noted that automated systems facilitated interlibrary loan services and improved resource sharing, significantly reducing duplication of effort. The study recommended nationwide standardization of automated systems to

enhance interoperability and resource sharing. This result is in tandem with Eze and Nwachukwu (2019) who showed that ILS adoption significantly improved cataloging, circulation, and reporting functionalities. However, challenges such as high implementation costs and lack of technical know-how were identified. Khan et al. (2017) examined the Impact of Automation on Acquisition and Cataloging Processes in University Libraries in Pakistan. The study found that automation significantly improved the speed and accuracy of acquisition and cataloging operations. However, a lack of IT training among staff was identified as a significant barrier. In university libraries, ARM has become a critical component in resource management, addressing the increasing demands of diverse academic communities. University libraries serve a multifaceted audience that requires access to a vast array of resources, including books, journals, e-books, multimedia, and digital archives (Li & Zhao, 2020). ARM systems facilitate the efficient organization of these resources by automating cataloging and classification processes, ensuring that materials are easily accessible to users. For example, automated acquisition modules integrated with vendor platforms can streamline the procurement of books and journals, reducing the time and administrative burden involved in traditional acquisition methods (Nguyen et al., 2021). Another significant advantage of ARM in university libraries is its role in improving resource accessibility and utilization. With automated systems, libraries can implement advanced search functionalities that allow users to locate resources based on keywords, subjects, or metadata, often powered by natural language processing (NLP) algorithms (Rahman & Ahmed, 2022).

#### **Impact of AI-Based User Support Systems on Management of Federal Universities Libraries**

This research hypothesis which addressed the impact of AI-Based User Support Systems on management of Federal Universities Libraries revealed that there was a significant impact of AI-Based User Support Systems on management of Federal Universities libraries in North western State, Nigeria. This result conforms Smith and Johnson (2023) who that AI-based support systems significantly improved the speed and accuracy of user query

resolution, reduced librarian workload, and enhanced user satisfaction. Challenges such as system integration issues and high initial costs were noted. The finding is also in agreement with Chowdhury and colleagues (2022) study who finding revealed that AI chatbots enhanced user engagement, improved query resolution rates, and reduced response times. The study highlighted the need for contextual adaptation of chatbots to cater to diverse user needs. Also, in consonant with Okafor and Adeyemi (2021) findings which revealed that AI systems improved navigation of digital resources, enhanced personalized user experience, and supported advanced research inquiries. Barriers such as limited technical infrastructure and resistance to AI adoption were noted. This result also agrees with Wang and Zhang (2020) who noted that virtual assistants reduced the workload of library staff, increased the efficiency of resource location, and enhanced user experience. However, gaps in multilingual capabilities and cultural nuances were identified. This result is in conformity with Garcia and Lopez (2019) who noted that AI recommendation systems improved user discovery of relevant resources and increased library usage rates. However, technical issues such as data privacy concerns were noted. Also, this result is in tandem with Ibrahim and colleagues (2018) who noted that AI-powered tools enhanced resource accessibility, supported advanced search functionalities, and increased overall user satisfaction. Barriers such as high costs of implementation and limited local language support were noted. AI-powered chatbots can provide 24/7 assistance to students and faculty, answering queries about library hours, borrowing policies, or resource locations without requiring human intervention (Zhao & Wang, 2020). Such systems also employ NLP to understand and process user inquiries in natural language, enabling intuitive and conversational interactions (Rahman & Aziz, 2021). A significant application of AI-Based User Support Systems in university libraries is in personalized resource recommendations. Leveraging machine learning algorithms, these systems analyze user behavior, preferences, and search histories to suggest books, articles, or digital content tailored to individual needs (Smith & Lee, 2019).

### **Impact of Predictive Analytics on Management of Federal Universities Libraries**

This research hypothesis which addressed the impact of Predictive Analytics on management of Federal Universities Libraries revealed that there was a significant impact of Predictive Analytics on management of Federal Universities libraries in North western State, Nigeria. This result conforms Brown and Lee (2023) noted that predictive analytics significantly improved resource allocation and acquisition processes, leading to cost savings and increased user satisfaction. Challenges identified included data quality issues and limited staff expertise in analytics. The finding also confirmed that of Singh, et al. (2022) who studied Predictive Analytics and Its Effect on Collection Development in Indian University Libraries. Their findings demonstrated that predictive analytics tools enabled librarians to anticipate user needs better, thereby improving collection relevance and usage rates. However, inadequate technological infrastructure limited full adoption. The finding is in agreement with Martinez and Gomez (2021) which investigated the Role of Predictive Analytics in Enhancing User Experience in University Libraries in Spain. Their Results indicated that predictive analytics improved personalized resource recommendations and service delivery, boosting user engagement and satisfaction. Key challenges included privacy concerns and lack of transparency in algorithmic decisions. The finding is also in consonant with Al-Farsi and Al-Harthy (2020) study which revealed that predictive analytics helped anticipate user demand patterns, enabling proactive management of resources and staffing. Nguyen and Tran (2019) study also on Predictive Analytics for Optimizing Digital Resource Management in Vietnamese University Libraries found that predictive analytics improved the management of digital collections by forecasting demand trends and optimizing subscription renewals. Technical infrastructure gaps and budget constraints were noted as barriers. Additionally, the finding resonant that of Okeke and Chukwu (2018) who investigated the Impact of Predictive Analytics on Decision-Making Processes in Nigerian University Libraries. Their study found that predictive analytics significantly enhanced decision-making accuracy concerning acquisitions, staffing, and service delivery.

Barriers included inadequate data infrastructure and limited staff training.

## Conclusion

This study investigated the impact of Artificial Intelligence applications on the management of Federal University Libraries in North-Western Nigeria. The findings reveal a clear consensus among librarians that AI technologies specifically in cataloging, automated resource management, user support, and predictive analytics exert a significant positive influence. By enhancing the accuracy and speed of metadata assignment, optimizing acquisition and inventory processes, providing real-time user assistance, and enabling data-driven forecasting, these tools collectively improve operational efficiency and service quality. However, this transformative potential is not yet fully realized. The research underscores a critical dissonance between the perceived value of AI and its effective implementation, evidenced by persistent challenges such as insufficient technical infrastructure, a pronounced skills gap among library staff, and inconsistent system performance in specific functional areas. These barriers highlight that the adoption of AI in this context remains nascent and uneven. Ultimately, while AI offers a powerful framework for modernizing library management and aligning Nigerian academic libraries with global standards, its success is contingent upon a foundational shift from passive acknowledgment to active, strategic, and well-supported integration.

## Recommendations

Based on the specific findings of this study, the following four recommendations are proposed:

1. Implement Targeted, Continuous Capacity-Building Programs for Library Staff. The findings indicate that inadequate training is a key barrier, with librarians reporting insufficient skills to effectively utilize AI tools (e.g., Item 8 in Cataloging, mean 2.46). To address this, university libraries, in partnership with bodies like TETFund, should establish mandatory, ongoing workshops and certification courses focused on digital literacy, data analytics, and the specific AI systems in use. This will

empower staff to transition from system operators to strategic managers of AI-enhanced services.

2. Develop and Fund a Phased AI Integration Roadmap Focused on Core Infrastructure. Given the challenges related to infrastructure and inconsistent system performance (e.g., low mean scores on workload reduction and predictive forecasting items), a haphazard adoption approach is inadvisable. Each library should create a strategic plan that prioritizes investment in reliable power solutions, robust internet connectivity, and interoperable library management software as a foundational first phase, before layering on advanced AI modules like predictive analytics.
3. Establish a Consortium for Shared AI Resources and Best Practices among North-Western University Libraries. To mitigate the high costs and technical burdens identified, the libraries in this region should formalize a collaborative consortium. This body could facilitate the pooled procurement of AI software licenses, develop shared digital repositories, and create a forum for librarians to exchange implementation strategies, training materials, and solutions to common technical problems, thereby accelerating learning and reducing individual institutional risk.
4. Initiate a Pilot Project for Advanced Predictive Analytics in Collection Development. Since predictive analytics showed strong potential for aiding acquisition decisions (Item 26, mean 2.70) but weaker impact on forecasting user demand (Item 25, mean 2.48), a focused initiative is recommended. A select library should pilot a predictive analytics module using its existing circulation and usage data to generate evidence-based acquisition lists and weeding schedules. The results of this pilot should be rigorously evaluated and disseminated to build a compelling, local case study to guide wider, more effective adoption across the sector.

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