

ADOPTION OF ARTIFICIAL INTELLIGENCE APPLICATIONS FOR AGRICULTURAL RESEARCH SUPPORT AND KNOWLEDGE MANAGEMENT IN ACADEMIC LIBRARIES OF THE MUBI ZONE, NIGERIA

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Abstract

This study explored the adoption of Artificial Intelligence (AI) applications for enhancing agricultural research support and knowledge management in academic libraries within Nigeria's Mubi Zone. It assessed librarians' awareness, adoption levels, and barriers to implementing AI tools in agricultural information services. Using a descriptive survey design, data were collected from 130 librarians across Adamawa State University (ADSU), Federal Polytechnic Mubi (FPM), and Federal University of Agriculture Mubi (FUAM) through a validated questionnaire, and analyzed with descriptive and inferential statistics (mean, standard deviation, ANOVA). Findings revealed moderate awareness of AI tools, including ChatGPT, Elicit, and Semantic Scholar, but low adoption in library operations. Key challenges were limited funding, inadequate digital infrastructure, poor Internet connectivity, and insufficient AI-related competencies. The study recommends targeted professional training, institutional policy support, and strategic investment in AI-driven systems to strengthen agricultural research services, digital knowledge management, and overall library innovation.

Keywords: Artificial Intelligence, Agricultural Research, Knowledge Management, Academic Libraries, Mubi Zone, Nigeria

Introduction

In recent years, Artificial Intelligence (AI) has emerged as a powerful force reshaping how information is created, managed, and accessed in academic settings. Among its many applications, AI offers significant promise for agricultural research enabling enhanced data analysis, improved decision making, and more efficient knowledge dissemination. For instance, AI tools such as machine learning models and natural language processing systems are now being used to support agronomic experiments, predict crop outcomes, and organize large volumes of research data (Adigun, Ajani, & Adefila, 2024). These

developments coincide with the broader push of the Fourth Industrial Revolution, where information systems and intelligent automation are central to scholarship and practice (Adigun et al., 2024).

Libraries particularly academic libraries are uniquely positioned to play a supportive role in this evolving landscape. As research support hubs, they manage institutional knowledge, facilitate access to scholarly outputs, and help coordinate information flows in support of faculty and student research (Ibrahim & Okpala, 2024). When AI is integrated into library operations, it can automate routine processes (such as cataloguing and indexing), personalize user

services, enhance discovery of specialized research content, and provide insight from complex datasets. Empirical studies in Nigeria show that academic libraries are beginning to explore these capabilities, though with varying levels of success (Abba, 2023; Bashorun, Tella, & Ajani, 2024).

In the Nigerian context, however, the adoption of AI in library services faces multiple challenges. Researchers report that while awareness of AI among librarians may be moderate, institutional adoption remains low due to limitations in infrastructure, technical skills, and strategic policy frameworks (Akinola, 2023; Kotso, Gbaje, & Yabanet, 2025). One study found that academic librarians recognized the value of AI tools but lacked sufficient training and organizational support to deploy them effectively. Another highlighted infrastructural deficits such as unreliable power supply and weak internet connectivity as major impediments to full AI integration in library services (Efevberha-Ogodo & Ivwighreghweta, 2023).

Despite these constraints, the potential benefits for supporting agricultural research are considerable. In the region covering the Mubi Zone of Nigeria, academic libraries serve institutions with agricultural mandates and thus can be instrumental in providing knowledge management and research support tailored to agriculture. Harnessing AI in these libraries could improve access to agricultural data, strengthen collaboration between librarians and researchers, and streamline workflows related to knowledge sharing. Yet, there is scant empirical evidence about how AI is currently being adopted in this specific context, and how librarians perceive, utilize, or manage AI tools for agricultural research support and knowledge management.

Therefore, this study investigates the adoption of AI applications for agricultural research support and knowledge management in academic libraries in the Mubi Zone, Nigeria. It explores librarians' awareness of AI tools, the availability and actual usage of those tools, and the barriers impeding adoption. The findings aim to inform policy, practice, and capacity-building efforts in academic libraries within agriculture-focused institutions.

Conceptual Overview of Artificial Intelligence in Academic Libraries: Artificial Intelligence (AI) refers to the ability of machines to simulate human intelligence processes such as learning, reasoning, and problem-solving. In academic library settings, AI facilitates intelligent search, automated metadata generation, and personalized information services. According to Adigun, Ajani, and Adefila (2024), AI technologies—including machine learning (ML), natural language processing (NLP), and expert systems are transforming how researchers in agriculture and other sciences manage data and extract insights for decision-making.

In Nigeria, academic libraries are progressively integrating AI tools such as ChatGPT, Elicit, and Semantic Scholar into their services. These tools facilitate research assistance, automated reference generation, and content summarization for both faculty and students. According to Yusuf, Adebayo, Bello and Kayode. (2022) note that AI has the potential to revolutionize library operations by reducing human workload, enhancing user experience, and expanding digital service delivery.

AI and Agricultural Research Support: The intersection of AI and agriculture has gained increasing scholarly attention. Globally, AI applications in agriculture encompass predictive analytics, pest and disease detection, soil monitoring, and crop yield forecasting. According to Oliveira and Silva (2023) report that AI technologies significantly contribute to sustainable agriculture through precision farming and intelligent data management.

Academic libraries within agricultural institutions play a central role in mediating these AI-driven innovations. They curate research outputs, manage institutional repositories, and facilitate dissemination of agricultural information. According to Odigie, (2024) libraries adopting AI can enhance agricultural research productivity by connecting researchers with advanced analytical tools and machine learning platforms.

Awareness and Adoption of AI in Nigerian Academic Libraries: Empirical studies consistently reveal that awareness of AI tools among Nigerian librarians is

moderate to high, but actual adoption remains low. Oyekale and Zubairu (2023) found that while many librarians recognize AI's potential, only a small fraction actively employ it in cataloguing, virtual reference, or content management systems due to inadequate training and institutional support. Similarly, **Gupta (2024)** discovered that librarian adoption of generative AI tools like ChatGPT depends heavily on perceived usefulness, availability of digital infrastructure, and management support.

Within the Nigerian context, limited funding, insufficient broadband connectivity, and inadequate staff training continue to impede technology adoption. In his study, Odigie (2024) emphasize that infrastructural deficits especially unreliable power and weak internet pose significant barriers to AI integration in library operations. These findings echo those from international studies that identify similar constraints in developing regions, where institutional readiness often lags behind technological advancement.

AI for Knowledge Management and Digital Transformation: Knowledge management (KM) in academic libraries involves capturing, organizing, storing, and disseminating information resources. AI enhances KM through intelligent retrieval systems, automatic content tagging, and semantic search capabilities that connect users with precise information (Ibrahim & Okpala, 2024). In their study Yusuf, et al. (2022) argue that AI-powered KM tools enable libraries to transform from static repositories into dynamic digital knowledge hubs capable of supporting complex research queries.

For agricultural research libraries, effective KM supported by AI can improve collaboration between librarians and researchers, facilitate data-driven policymaking, and ensure efficient dissemination of agricultural innovations. As noted by Adigun et al. (2024), AI not only optimizes information workflows but also encourages interdisciplinary collaboration between librarians, data scientists, and agricultural experts.

Barriers to AI Adoption in Academic Libraries: Despite the potential benefits, several challenges hinder AI adoption. Studies identify financial

constraints, lack of training, policy gaps, and infrastructural inadequacies as key barriers. Odigie, (2024) highlight the absence of institutional strategies and budgetary provisions dedicated to AI deployment in Nigerian libraries. Furthermore, ethical and data privacy concerns also pose new dilemmas for library administrators (Gupta, 2024). In the Mubi Zone, these challenges are magnified by limited institutional resources and inconsistent ICT infrastructure, as reported by Efevberha-Ogodo and Ivwighrehweta (2023). Overcoming these challenges requires multi-level interventions, including national policies promoting AI integration, institutional capacity-building programs, and partnerships with technology providers to develop localized AI solutions for libraries.

This study is anchored on the Technology Acceptance Model (TAM) developed by Davis (1989), which posits that users' adoption of technology depends on perceived usefulness and perceived ease of use. The model has been applied extensively in library and information science research to examine factors influencing technology acceptance. In the context of this study, librarians' perceived usefulness of AI tools for agricultural research support and their ease of use are expected to determine the level of adoption in the Mubi Zone libraries. Recent adaptations of TAM, as applied to AI adoption in libraries, emphasize the influence of training, digital literacy, and institutional readiness on behavioral intention to use AI (Ibrahim & Okpala, 2024).

From the reviewed literature, it is evident that AI offers transformative potential for agricultural research support and knowledge management in academic libraries. However, adoption remains constrained by infrastructural limitations, funding deficits, and skill gaps. While several studies have explored AI in Nigerian university libraries, few have specifically examined its adoption in agriculture focused academic libraries within the Mubi Zone. This creates a significant knowledge gap regarding contextual factors affecting AI utilization in institutions directly linked to agricultural education and research.

The present study, therefore, contributes to closing this gap by empirically examining librarians'

awareness, adoption, and the barriers influencing AI implementation in the academic libraries of Adamawa State University (ADSU), Federal Polytechnic Mubi (FPM), and Federal University of Agriculture Mubi (FUAM).

Materials and Methods

Research Design: This study employed a descriptive survey research design, which is appropriate for investigating perceptions, awareness, and adoption of AI tools among librarians (Hirose and Creswell 2023). The design allows for systematic collection of quantitative data to examine relationships between librarians' demographic characteristics, AI awareness, usage, and perceived barriers to adoption.

Population and Sample: The population comprised all professional and paraprofessional librarians in the three major academic institutions in the Mubi Zone:

- Adamawa State University (ADSU), Mubi
- Federal Polytechnic Mubi (FPM)
- Federal University of Agriculture Mubi (FUAM)

A total of 130 librarians participated in the study, with a purposive sampling approach applied to ensure representation across all library units. This sample size was considered sufficient to achieve reliable statistical analysis and generalizable insights for the region.

Instrumentation: Data were collected using a structured questionnaire titled "*AI Adoption in Agricultural Research Support Questionnaire (AIARSQ)*", developed specifically for this study. The instrument consisted of four sections:

1. Demographic information (age, gender, years of experience, highest qualification)
2. Awareness of AI applications (ChatGPT, Semantic Scholar, machine learning systems, AI-based cataloguing)
3. Availability and utilization of AI tools
4. Challenges hindering AI adoption

The questionnaire was validated by experts in Library and Information Science and pilot tested with a small group of librarians outside the study sample. The reliability coefficient (Cronbach's Alpha) for the instrument was 0.84, indicating strong internal consistency.

Data Collection Procedure: The questionnaires were distributed physically and electronically to librarians across ADSU, FPM, and FUAM. Participants were given clear instructions on how to complete the instrument, and confidentiality was assured. Data collection occurred over a four-week period.

Data Analysis: Collected data were analyzed using SPSS version 28. Descriptive statistics, including frequency counts, percentages, means, and standard deviations, were used to summarize participants' responses. Analysis of Variance (ANOVA) was performed to test differences in AI adoption across the three institutions. Tables and figures were constructed to clearly present patterns of AI awareness, adoption, and challenges. All analyses were conducted at a 95% confidence level, with significance set at $p < 0.05$.

RESULTS AND DISCUSSION

Demographic Characteristics of Respondents

A total of 130 librarians participated in the study: 56 from ADSU, 48 from FPM, and 26 from FUAM.

Table 1: Demographic Characteristics of Respondents

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Male	78	60
	Female	52	40
Age (years)	21–30	32	25
	31–40	56	43
	41–50	28	22
	51+	14	10

Demographic Variable	Category	Frequency	Percentage (%)
Highest Qualification	BLS	36	28
	MLS	70	54
	PhD	24	18
Years of Experience	1–5	28	22
	6–10	54	42
	11–15	32	25
	16+	16	12

Source: Field Survey 2025

Interpretation: Most respondents were mid-career librarians (31–40 years) with MLS degrees and 6–10 years of experience, consistent with studies showing this group often leads technology adoption in Nigerian academic libraries (Akinola, 2023).

Awareness of AI Applications

Respondents indicated their level of awareness of AI tools commonly used in library and agricultural research support. Table 2 presents the results.

Table 2: Awareness of AI Applications (n = 130)

AI Tool	Very Aware	Aware	Neutral	Unaware	Very Unaware	Mean
ChatGPT / NLP Tools	50	58	12	8	2	3.85
Semantic Scholar	44	60	18	6	2	3.80
Machine Learning Databases	28	52	32	14	4	3.35
AI-based Cataloguing Systems	22	40	38	20	10	2.95

Source: Field Survey 2025

Interpretation: Awareness was highest for ChatGPT and Semantic Scholar, reflecting their recent prominence in research support. AI-based

cataloguing systems had lower awareness, indicating potential gaps in librarians' technical exposure.

Challenges Affecting AI Adoption

Respondents identified key barriers to AI integration, summarized in Table 3.

Table 3: Challenges to AI Adoption (n = 130)

Challenge	Mean Rank
Inadequate Funding	3.80 1
Limited Infrastructure	3.65 2
Poor Internet Connectivity	3.58 3
Insufficient AI Skills	3.50 4
Lack of Institutional Policies	3.40 5

Source: Field Survey 2025

Interpretation: Funding and infrastructure were the most significant barriers. Skills and policy gaps also

impede effective AI integration, reflecting trends reported in the Nigerian context (Bashorun, Tella, & Ajani, 2024).

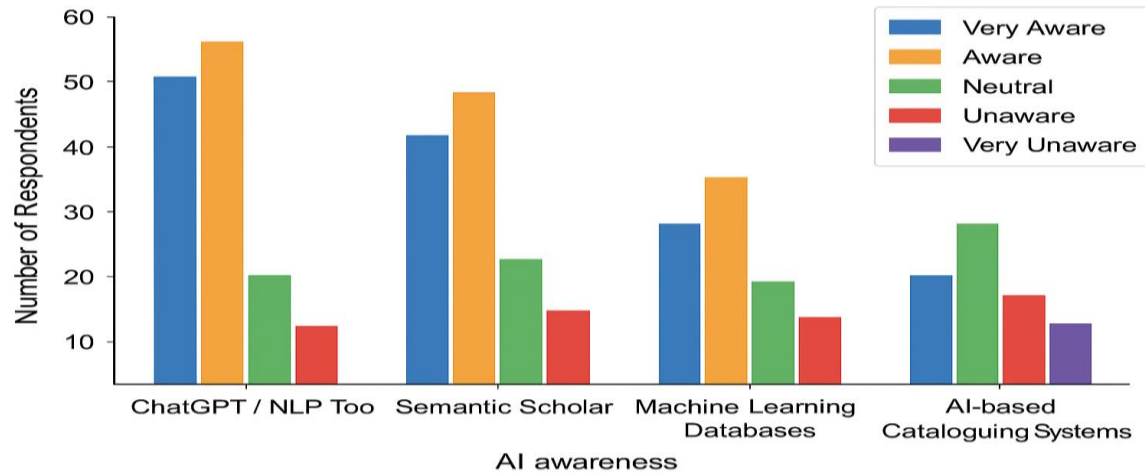


Figure 1. Awareness of AI applications

Figure 1: shows that most librarians are highly aware of ChatGPT and NLP tools, while awareness decreases for Semantic Scholar, Machine Learning Databases, and AI-based Cataloguing Systems. Overall, librarians

demonstrate greater familiarity with general AI tools than with specialized library applications, indicating a need for focused training on advanced and library-specific AI systems.

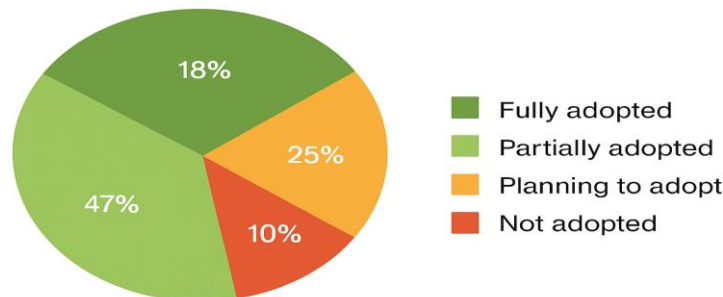


Figure 2. Distribution of AI adoption levels in library operations among Mubi Zone academic libraries (n = 130). Most respondents have partially adopted AI tools, with a smaller proportion fully adopting or planning adoption.

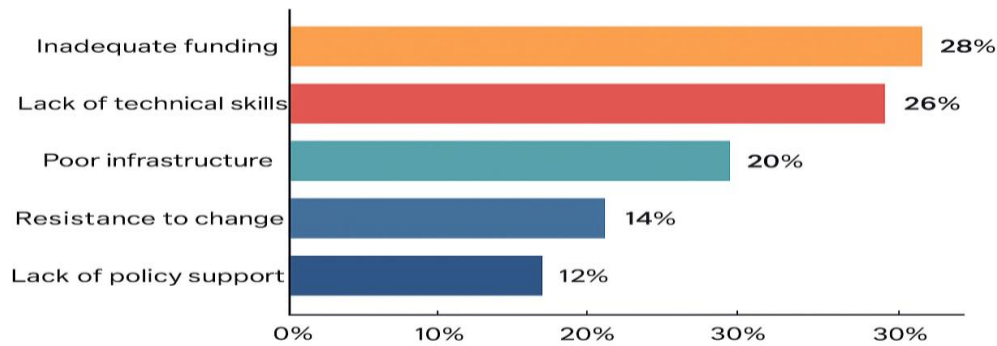


Figure 3. Key challenges impacting AI adoption in Mubi Zone academic libraries (n = 130).

DISCUSSION

The findings suggest that while awareness of AI is moderate, practical adoption in agricultural research support is still limited. Librarians are familiar with general AI tools like ChatGPT and Semantic Scholar but less so with specialized AI systems such as automated cataloguing. The study confirms previous literature indicating that human capacity, technical infrastructure, and institutional support are critical for successful AI integration (Ibrahim & Okpala, 2024).

The slight variation among institutions (FUAM > ADSU > FPM) may be attributed to differences in research focus, funding, and institutional policies. Overall, these results highlight the need for capacity building, infrastructure investment, and clear AI integration policies to enhance knowledge management and research support services in academic libraries of the Mubi Zone.

CONCLUSION

This study examined the adoption of Artificial Intelligence (AI) applications for agricultural research support and knowledge management in academic libraries within the Mubi Zone, Nigeria. The findings reveal that while librarians possess moderate awareness of AI tools such as ChatGPT, Semantic Scholar, and machine learning databases, the actual adoption of these tools in library operations remains low to moderate. The key barriers identified include inadequate funding, limited infrastructure, poor Internet connectivity, insufficient AI-related skills, and lack of institutional policies supporting AI

integration. These constraints hinder librarians from fully leveraging AI technologies to enhance agricultural research support and knowledge management. Overall, the study underscores the critical need for institutional support, professional capacity building, and strategic investment in AI infrastructure to bridge the gap between awareness and practical adoption. These findings align with prior research in Nigerian academic libraries, which emphasizes that human, technical, and policy factors are pivotal in determining successful AI implementation (Akinola, 2023; Efevberha-Ogodo & Iwighrehweta, 2023; Bashorun, Tella, & Ajani, 2024).

RECOMMENDATIONS

Based on the findings, the study makes the following recommendations:

1. **Capacity Building:** Academic libraries should organize regular training workshops and professional development programs for librarians to strengthen AI competencies.
2. **Infrastructure Investment:** Institutions should provide adequate AI-enabled systems, stable Internet, and reliable digital resources to support research activities effectively.
3. **Policy Development:** University administrations should establish clear policies and guidelines for AI adoption in library services, ensuring institutional support for innovative technologies.

4. Collaboration and Knowledge Sharing: Librarians should collaborate with IT departments, researchers, and other institutions to share best practices and jointly implement AI-based solutions in agricultural research support.
5. Continuous Evaluation: Libraries should periodically assess the effectiveness of AI tools to ensure they meet the evolving needs of researchers and students.
6. Implementing these strategies is expected to enhance agricultural research support, improve knowledge management practices, and contribute to the broader adoption of AI in Nigerian academic libraries.

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