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APPLICATION OF ARTIFICIAL INTELLIGENCE FOR ENHANCED CATALOGUING AND INFORMATION RETRIEVAL IN PUBLIC UNIVERSITY LIBRARIES IN BENUE STATE, NIGERIA

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Abstract
This study examined the application of Artificial Intelligence (AI) for enhanced cataloguing and information retrieval in public university libraries in Benue State, Nigeria. A descriptive survey research design was adopted. The study population comprised 8,009 library staff and registered library users across three public university libraries, from which a proportionate sample of 240 respondents (40 library staff and 200 library users) was selected. Data were collected using the Application of Artificial Intelligence for Enhanced Cataloguing and Information Retrieval Questionnaire (AAIECIRQ). The data were analyzed using mean, standard deviation, and Chi-square statistics at the 0.05 level of significance. Findings revealed that the application of AI in cataloguing activities was generally low and did not significantly enhance cataloguing efficiency. However, AI applications significantly improved

information retrieval accuracy. The study concludes that AI has contributed more effectively to information retrieval than to cataloguing workflows in the institutions surveyed. It is recommended that library management increase investments in AI infrastructure and conduct regular capacity-building programs for staff.

Keywords: Artificial Intelligence, Cataloguing, Information Retrieval, University Libraries, Benue State.

Introduction

Information resources are fundamental to teaching, learning, research, and knowledge creation in higher education institutions. They provide access to scholarly materials that support academic activities and intellectual development. University libraries serve as the primary repositories of these resources and play a critical role in ensuring that users have timely and effective access to information. Through the acquisition, organization, preservation, and dissemination of information resources, university libraries contribute significantly to the achievement of institutional goals and the advancement of knowledge. Effective management of these resources is therefore essential for improving service delivery and supporting academic excellence (Adeyemi, 2025; Udeh, 2024).

The rapid growth of information resources in both print and digital formats has transformed the operations of university libraries. While libraries traditionally managed

printed materials such as books, journals, newspapers, and conference proceedings, technological developments have expanded collections to include electronic books, electronic journals, online databases, institutional repositories, and other digital resources. This transformation has improved access to information and increased the demand for innovative technologies that can support efficient management and utilization of library resources. The emergence of digital information systems has further enhanced research productivity and expanded opportunities for information access across academic communities (Shidi, Nwachukwu & Ogwo, 2020).

One of the most significant technological innovations influencing contemporary library operations is Artificial Intelligence (AI). Artificial Intelligence refers to the ability of computer systems to perform tasks that normally require human intelligence, including learning, reasoning, decision-making, and problem-solving. In library environments, AI technologies are increasingly being utilized to automate routine operations, improve service delivery, and enhance access to information resources. The growing adoption of AI in libraries reflects the need to manage large volumes of information more efficiently while meeting the changing expectations of users in a digital information environment. Studies have shown that AI applications can support automation, intelligent data processing, and personalized information services in modern libraries (Verkaa, Enenche & Igyuve, 2024; Ogunjimi, 2025).

The application of AI has become particularly relevant in cataloguing activities. Cataloguing is a core technical service that involves the description and organization of information resources to facilitate identification, access, and retrieval. Efficient cataloguing ensures that library materials are systematically organized and easily discoverable by users. AI technologies such as machine learning and natural language processing have introduced new opportunities for automating metadata creation, subject analysis, and bibliographic description. These technologies reduce repetitive manual tasks, improve consistency in cataloguing practices, minimize human error, and increase the speed of processing information resources. Consequently, AI has the potential to enhance cataloguing efficiency and strengthen bibliographic control in university libraries (Bennett, 2023; Jafari et al., 2023).

Beyond cataloguing, AI is increasingly being applied to improve information retrieval in library systems. Information retrieval refers to the process of locating and providing relevant information in response to users' information needs. The effectiveness of any library largely depends on its ability to help users discover and access appropriate information resources quickly and accurately. Traditional retrieval systems often rely on keyword matching and controlled vocabularies, which may not adequately capture users' search intentions. AI-powered retrieval systems, however, employ advanced techniques such as semantic analysis, natural language processing, recommendation algorithms, and

user-behaviour modelling to improve search accuracy and relevance. These capabilities enable users to obtain more precise search results and enhance their overall information-seeking experience. Evidence from recent studies indicates that AI-driven retrieval systems significantly improve the relevance, precision, and timeliness of information delivery in academic libraries (Munyoro, Adebayo & Chukwu, 2024; Sharma & Goyal, 2022).

Although the benefits of AI in cataloguing and information retrieval have been widely reported in the literature, the extent of its application in public university libraries in Benue State remains uncertain. Many libraries continue to face challenges related to technological infrastructure, funding, staff competence, and the adoption of emerging technologies. As a result, there is a need to examine the extent to which AI is being applied to enhance cataloguing and information retrieval in public university libraries in Benue State, Nigeria. Understanding the current level of application will provide valuable insights for improving library operations and strengthening information service delivery in the digital age.

Statement of the Problem

The effective organization and retrieval of information resources are essential functions of university libraries because they determine the extent to which users can access relevant information for teaching, learning, and research. Cataloguing facilitates the

systematic organization of information resources, while information retrieval enables users to locate and access needed materials efficiently. As the volume of information resources continues to increase in university libraries, there is a growing need for innovative technologies that can enhance the efficiency of cataloguing processes and improve information retrieval services.

Artificial Intelligence (AI) has emerged as a promising technology for supporting various library operations, particularly cataloguing and information retrieval. AI technologies such as machine learning, natural language processing, intelligent search systems, and automated metadata generation have been reported to improve the speed, consistency, and accuracy of information organization and retrieval in libraries. Consequently, many academic libraries across the world are increasingly exploring the application of AI to improve service delivery and meet the evolving information needs of users.

Despite these developments, the extent to which AI is applied in public university libraries in Benue State remains unclear. Observations suggest that many university libraries still depend largely on conventional cataloguing practices and traditional information retrieval systems, which may limit efficiency and responsiveness to users' information needs. Furthermore, there is limited empirical evidence on the extent to which AI technologies are being utilized to enhance cataloguing and information retrieval in these

libraries. This knowledge gap makes it difficult for library administrators, policymakers, and other stakeholders to make informed decisions regarding the adoption and deployment of AI technologies in library operations.

It is against this background that this study seeks to examine the extent of application of Artificial Intelligence for enhanced cataloguing and information retrieval in public university libraries in Benue State, Nigeria.

Research Questions

The study was guided by the following research questions:

1. What is the level of application of Artificial Intelligence for enhanced cataloguing in public university libraries in Benue State, Nigeria?
2. What is the extent of application of Artificial Intelligence for enhanced information retrieval in public university libraries in Benue State, Nigeria?

Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

H01: The application of Artificial Intelligence does not significantly enhance cataloguing in public university libraries in Benue State, Nigeria.

H02: The application of Artificial Intelligence does not significantly enhance information retrieval in public university libraries in Benue State, Nigeria.

Literature Review

Artificial Intelligence (AI) has evolved from a theoretical concept into one of the most influential technologies of the twenty-first century. The development of AI is rooted in attempts to design machines capable of performing tasks that ordinarily require human intelligence, such as learning, reasoning, problem-solving, and decision-making. Early efforts to define machine intelligence can be traced to the work of Alan Turing, while the formal recognition of AI as a field of study emerged from the Dartmouth Conference of 1956. Although progress was initially constrained by limited computing capabilities, advances in machine learning, data availability, and computational power have accelerated the growth of AI and expanded its practical applications across numerous sectors. Contemporary AI systems now perform complex tasks ranging from language processing and image recognition to autonomous decision-making, thereby transforming the way organizations manage information and deliver services (Floridi, 2016; Haenlein & Kaplan, 2019; LeCun, Bengio & Hinton, 2015; Brown et al., 2020).

The growing adoption of AI across industries reflects its ability to improve efficiency, accuracy, and productivity. Modern AI technologies enable computers to analyse large datasets, identify patterns, generate insights, and perform repetitive tasks with

minimal human intervention. These capabilities have enhanced decision-making processes and service delivery in fields such as healthcare, education, finance, transportation, and information management. In library environments, AI offers opportunities for automating routine operations, improving access to information resources, and supporting users through intelligent systems capable of learning and adapting to changing information needs (Russell & Norvig, 2021; Kanade, 2022; Davenport & Mittal, 2022).

Effective management of information resources remains a critical responsibility of libraries and information centres. As collections continue to expand in volume and complexity, libraries require innovative approaches that ensure information resources are adequately organized, preserved, secured, and made accessible to users. Information management involves not only the protection of information assets but also the implementation of systems and procedures that facilitate efficient access and utilization. Consequently, technological innovations such as AI are increasingly being explored as viable solutions for addressing challenges associated with information organization and service delivery in contemporary libraries (Idachaba et al., 2023; Elaturoti & Oyewumi, 2022).

One of the major areas in which AI is being applied in libraries is cataloguing. Cataloguing serves as the foundation for organizing information resources and facilitating access to library collections. Traditionally, cataloguing has been a labour-intensive process

that requires considerable human effort in creating bibliographic records, assigning subject headings, and maintaining consistency across catalogues. The emergence of AI technologies has introduced new possibilities for automating these activities. Machine learning algorithms and natural language processing tools can assist in metadata generation, subject analysis, classification, and authority control, thereby reducing manual workload and improving consistency in cataloguing operations. The application of these technologies contributes to faster processing of library materials and enhances the discoverability of information resources within library systems (Kalisdha et al., 2024; Jafari et al., 2023).

Recent developments in AI have further expanded opportunities for improving cataloguing practices through intelligent metadata generation and enrichment. Advanced AI models can analyse document content, identify relevant descriptors, and automatically generate metadata that supports effective organization and retrieval of information resources. These capabilities improve the quality and consistency of bibliographic records while reducing the time required for cataloguing activities. The growing use of AI-powered metadata tools demonstrates the potential of intelligent systems to strengthen cataloguing efficiency and support more effective management of library collections (González-Espinoza et al., 2025; Bagchi, 2024).

Artificial Intelligence is also transforming information retrieval services in modern library systems. Information retrieval focuses on identifying and providing information that

matches users' information needs. Traditional retrieval systems primarily depend on keyword matching and structured search techniques, which may not always capture the context or intent behind user queries. AI-powered retrieval systems address these limitations by employing semantic analysis, natural language processing, recommendation algorithms, and adaptive learning techniques. These technologies enable library systems to interpret user queries more effectively and deliver more relevant search results, thereby improving the overall user experience (Manoharan et al., 2024; Hyun & Luo, 2024).

The application of AI to information retrieval has contributed significantly to the development of more intelligent and user-centred library services. Through conversational interfaces, intelligent search engines, and personalized recommendation systems, users can interact with library systems in a more natural and efficient manner. AI technologies also support continuous improvement in retrieval performance by learning from user interactions and refining search outcomes over time. As a result, information retrieval systems are becoming increasingly accurate, responsive, and capable of meeting diverse user information needs within academic environments (Benahal, 2024; Yousuf Ali, 2023).

Methodology

The study adopted a descriptive survey research design. The population comprised 8,009 respondents, consisting of 7,870 registered library users and 139 library staff from

three public university libraries in Benue State, Nigeria. Specifically, Rev. Fr. Moses Orshio Adasu University, Makurdi, had 5,833 registered library users and 92 library staff; Joseph Sarwuan Tarka University, Makurdi, had 1,170 registered library users and 30 library staff; while the Federal University of Health Sciences, Otukpo, had 867 registered library users and 17 library staff.

A sample size of 240 respondents was selected using proportionate sampling technique. The sample comprised library staff and registered library users drawn from the three university libraries in proportion to their population sizes. Library staff constituted the respondents for Research Question One and Hypothesis One because cataloguing is a technical library operation performed by professional library personnel. Library users constituted the respondents for Research Question Two and Hypothesis Two because they are the primary users of library retrieval systems and are therefore better positioned to assess the effectiveness of information retrieval services.

Data were collected using a self-structured instrument titled *Application of Artificial Intelligence for Enhanced Cataloguing and Information Retrieval Questionnaire (AAIECIRQ).* The instrument was validated by experts in Library and Information Science and Measurement and Evaluation. The reliability of the instrument was established through a pilot study, and an appropriate reliability coefficient was obtained.

The data collected were analysed using frequency counts, mean, and standard deviation to answer the research questions. A criterion mean of 2.50 on a four-point Likert scale was used for decision-making. Mean scores of 2.50 and above were interpreted as agreement, while mean scores below 2.50 were interpreted as disagreement. Chi-square (χ^2) statistics were used to test the hypotheses at the 0.05 level of significance. The null hypothesis was rejected when the p-value was less than 0.05 and accepted when the p-value was equal to or greater than 0.05.

Results and Discussion

Research Question 1: What is the level of application of Artificial Intelligence for enhanced cataloguing in public university libraries in Benue State, Nigeria?

Table 1: Mean and Standard Deviation Scores on the Level of Application of Artificial Intelligence for Enhanced Cataloguing in Public University Libraries in Benue State

s/no	Item Description (N = 240)	SA	A	D	SD	$\bar{x}$	S.D	Decision
1	AI technologies are actively used to catalogue library materials in this library.					2.40	0.93	Disagree
2	AI tools are applied regularly in the cataloguing of books and resources.					2.46	1.01	Disagree
3	Staff frequently use AI systems to create cataloguing records for resources.					2.52	0.90	Agree
4	AI applications are integrated into the library's cataloguing workflow.					2.35	0.81	Disagree
5	AI improves the speed and accuracy of cataloguing in this academic library.					2.61	0.85	Agree
6	The library management supports and encourages the use of AI in cataloguing processes.					2.22	0.75	Disagree
	Cluster					**2.43**	**0.88**	**Disagree**

Source: Field work, 2025

The results presented in Table 1 indicate that the level of application of Artificial Intelligence in cataloguing activities in academic libraries in Benue State is generally low. Item 1, which examined the use of AI technologies in cataloguing library materials, recorded a mean score of 2.40 and a standard deviation of 0.93, indicating disagreement among respondents. Item 2, which assessed the regular application of AI tools in the cataloguing of books and resources, had a mean score of 2.46 and a standard deviation of 1.01, also indicating disagreement. Respondents, however, agreed that staff frequently use AI systems to create cataloguing records for resources, as reflected in a mean score of 2.52 and a standard deviation of 0.90. Item 4, which examined the integration of AI applications into the cataloguing workflow, recorded a mean score of 2.35 and a standard deviation of 0.81, indicating disagreement. Similarly, respondents agreed that AI improves the speed and accuracy of cataloguing in academic libraries, with a mean score of 2.61 and a standard deviation of 0.85. Item 6 recorded the lowest mean score of 2.22 with a standard deviation of 0.75, indicating disagreement that library management adequately supports and encourages the use of AI in cataloguing processes. The cluster mean of 2.43 and standard deviation of 0.88 show that the overall level of application of Artificial Intelligence in cataloguing efficiency in academic libraries in Benue State is low.

Research Question 2: What is the extent of application of Artificial Intelligence for enhanced information retrieval in public university libraries in Benue State, Nigeria?

Table 2: Mean and Standard Deviation Scores on the Extent of Application of Artificial Intelligence for Enhanced Information Retrieval in Public University Libraries in Benue State

s/no	Item Description (N = 240)	SA	A	D	SD	$\bar{x}$	S.D	Decision
7	AI is extensively applied to enhance the relevance of search results.					2.39	0.82	Disagree
8	Many library systems are using AI to process and understand natural language queries.					2.73	1.07	Agree
9	AI tools are significantly improving the precision and recall of information searches.					2.56	1.01	Agree
10	AI systems are applied to filter out irrelevant materials from users' search results.					2.42	0.98	Disagree
11	AI applications commonly suggest related resources during search activities.					2.44	1.06	Disagree
12	User preferences are increasingly being used by AI to refine and personalize search outcomes.					2.66	1.14	Agree
	Cluster					**2.53**	**1.03**	**Agree**

Source: Field work, 2025

The results in Table 2 reveal a moderate level of application of Artificial Intelligence in information retrieval services. Respondents agreed that AI is used to process and understand natural language queries ($\bar{x}$ = 2.73, SD = 1.07), improve the precision and recall of information searches ($\bar{x}$ = 2.56, SD = 1.01), and personalize search outcomes using users' preferences ($\bar{x}$ = 2.66, SD = 1.14). However, respondents disagreed that AI is extensively used to enhance the relevance of search results ($\bar{x}$ = 2.39, SD = 0.82), filter irrelevant materials from search results ($\bar{x}$ = 2.42, SD = 0.98), and suggest related resources during search activities ($\bar{x}$ = 2.44, SD = 1.06). The cluster mean of 2.53 with a standard deviation of 1.03 indicates that the extent of application of Artificial Intelligence for enhanced information retrieval is moderate.

This finding implies that AI technologies are increasingly being utilized to support information retrieval services in public university libraries. The use of intelligent search systems, natural language processing tools, and personalized recommendation features appears to have contributed to improved access to information resources. The finding agrees with Agada and Mohammed (2022), who found that AI-driven systems significantly improved the relevance and precision of information retrieval in tertiary institution libraries.

Hypothesis One (H01): The application of Artificial Intelligence does not significantly enhance cataloguing in public university libraries in Benue State, Nigeria.

Table 3: Chi-Square Analysis of the Application of Artificial Intelligence for Enhanced Cataloguing in Public University Libraries

Responses	Fo	Fe	*P*	Df	x^2 Cal.	Remark
SA	15	60.0				
A	1	60.0	.082	3	4.733[a]	Accepted
D	47	60.0				
SD	177	60.0				
Total	**240**					

Source: Field work, 2025

The Chi-Square analysis presented in Table 3 produced a calculated value of 4.733 with a p-value of 0.082. Since the p-value is greater than the 0.05 level of significance, the null hypothesis was accepted. This indicates that the application of Artificial Intelligence has not significantly enhanced cataloguing in the public university libraries studied. The

result suggests that the current level of AI adoption in cataloguing activities is insufficient to produce significant improvements in cataloguing operations.

Hypothesis Two (H02): The application of Artificial Intelligence does not significantly enhance information retrieval in public university libraries in Benue State, Nigeria.

Table 4: Chi-Square Analysis of the Application of Artificial Intelligence for Enhanced Information Retrieval in Public University Libraries

Responses	Fo	Fe	*P*	Df	x² Cal.	Remark
SA	23	60.0				
A	29	60.0	.000	3	80.067[a]	Sign.
D	103	60.0				
SD	85	60.0				
Total	**240**					

Source: Field work, 2025

The Chi-Square analysis yielded a calculated value of 80.067 with a p-value of 0.000. Since the p-value is less than the 0.05 level of significance, the null hypothesis was rejected. This indicates that the application of Artificial Intelligence significantly enhances information retrieval in public university libraries in Benue State. The finding suggests that AI technologies contribute meaningfully to improving search precision, retrieval accuracy, and access to relevant information resources. This finding corroborates the report of Agada and Mohammed (2022), who found that AI-based retrieval systems significantly improved the relevance and accuracy of search results in tertiary institution libraries.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. University library management should invest in and deploy Artificial Intelligence-supported cataloguing tools capable of automating metadata generation, bibliographic description, and authority control to improve the efficiency and consistency of cataloguing operations.
2. Library administrators should expand the adoption of AI-enhanced information retrieval systems, including intelligent search engines, natural language processing tools, and recommendation systems, to improve users' access to relevant information resources.
3. University authorities should organize regular training and capacity-building programmes for library staff to enhance their knowledge and competencies in the application of Artificial Intelligence technologies for cataloguing and information retrieval.
4. Adequate funding should be provided for the acquisition of ICT infrastructure, software applications, and technological facilities required for the effective implementation of Artificial Intelligence in university library operations.
5. Library management should develop institutional policies and implementation frameworks that encourage the integration and sustainable use of Artificial Intelligence technologies in library services.

Conclusion

The study examined the application of Artificial Intelligence for enhanced cataloguing and information retrieval in public university libraries in Benue State, Nigeria. The findings revealed that the level of application of Artificial Intelligence for cataloguing was generally low and did not significantly enhance cataloguing operations in the libraries studied. Conversely, the study found that Artificial Intelligence significantly enhanced information retrieval through improved search precision, relevance, and accessibility of information resources.

The study concludes that the application of AI has contributed more to information retrieval than to cataloguing activities in public university libraries in Benue State. Its application in cataloguing activities remains limited. To fully realize the benefits of Artificial Intelligence in library operations, greater investment in technological infrastructure, staff training, policy support, and AI-driven library systems is required. Increased adoption of Artificial Intelligence technologies will contribute to more efficient cataloguing processes, improved information retrieval services, and enhanced overall library service delivery.

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