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AWARENESS OF THE CONTRIBUTION OF ARTIFICIAL INTELLIGE NCE (AI) FOR ENHANCING INFORMATION RETRIEVAL SYSTEM IN UNIVERSITY LIBRARIES IN SOKOTO, NIGERIA

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Abstract

Purpose: *The paper aimed to examine the level of awareness, preparedness, challenges, and strategies for integrating Artificial Intelligence (AI) into Information Retrieval (IR) systems in university libraries in Sokoto State, Nigeria.*

Design/Methodology/Approach: *A mixed-method approach was adopted, employing a descriptive survey design and thematic analysis. The population comprised 20 members of the library management committees from four purposively selected universities (federal, state, and private). Stratified sampling was used to select five ICT-inclined professionals from each university's library management committee.*

Findings: *Findings revealed that library management committees are fully aware of AI's contributions to enhancing IR systems. However, several challenges hinder effective AI adoption, including algorithm bias, lack of expertise, and insufficient funding. The study also showed that the level of preparedness for AI integration remains at an early stage due to infrastructural gaps and a shortage of AI-trained library personnel.*

Originality/Value: *The paper emphasizes the importance of AI adoption in university libraries to improve information retrieval efficiency and service delivery. It recommends the implementation of specialized AI training for library personnel, acquisition of AI-driven tools (e.g., Natural Language Processing, Machine Learning, and Chatbots), and enforcement of the NUC directive mandating 10% of recurrent expenditure be allocated to libraries.*

Keywords: *Artificial Intelligence, Information Retrieval, University Libraries, Sokoto, AI Integration, Library Management*

Paper type: *Empirical research*

Introduction

The advent of Information and Communication Technology (ICT) has initially seemed to be a threat that could sideline libraries and other information infrastructural institutions' routines, and sack information professionals from their jobs. This is as a result of the emergence of electronic information service providers such as Google among other web search engines, Educational Databases, Artificial Intelligence (AI) etc. And studies revealed that contemporary information users are more interested in Electronic Information

Resources (EIRs) compared to print resources. Aliyu and Gadanga (2024) citing Aliyu argued that; it is due to their flexibility, ease of use, remote access, simultaneous access etc. However, instead to allow that to happen, the information professionals applied those ICT innovations and packages in library services and operations to serve users better. Because web search engines provides user with thousand results which could be time consuming in tracing relevant information needs. While an information professional, going by the Ranganathan's fourths' law (to save the time of the reader) can provide a user with single and relevant information need. In this case, services rendered by information professionals are incomparable with other information service providers.

It is no doubt the rapid advancement of digital technology has transformed how information is organized, stored, accessed, and retrieved in libraries and information centres. Accessing and managing large volumes of information in the digital age requires information retrieval systems. They include elements like retrieval models, query processing, indexing, and user interfaces (Adelakun 2024). Information retrieval is the process of storing and representing knowledge as well as obtaining information that is pertinent to a particular user issue. Typically, information seekers formulate questions that attempt to characterize their information requirements (Mandi, 2009). Additionally, identifying and retrieving data related to the user's request is the main goal. Because there may be more than one relevant record, the results are often sorted based on how closely the records match the user's query. Traditional text retrieval systems from at the beginning of the IR area mostly depend on matching terms between documents and queries (Hamberde & Proenca, 2023).

Traditionally, Information Retrieval (IR) systems in libraries were designed to make available IR tools such as catalogue cards, indexes, abstracts, directories, bibliographies etc. to library users in locating information. Later on, Online Public Access Catalogue (OPAC) came on board to replace the traditional catalogue system. It is electronic database which contains bibliographic information about books and other materials in a library and made searching and retrieval of the bibliographic records easier and faster. OPAC was developed as part of library automation, and designed to allow library users to search information resources quickly and easily using search keywords like author, title, subject, ISBN etc.

However, despite the advantage of the OPAC according to Sampath, et al. (2024), traditional IR systems and OPAC became more insufficient as a result of the exponential growth in data volumes, diverse content formats, and varying user needs caused by the digital age. He added that these older systems' search functions were frequently inflexible and unable to adjust to the specific, occasionally subtle, which caused difficulties with usability, efficiency, and relevancy. In order to overcome these constraints and reconsider the effectiveness of their information retrieval (IR) systems, academic libraries began exploring Artificial Intelligence (AI) as a revolutionary strategy (Breeding, 2021). The complexity of library operations is also rising, beginning with the processing of information from multiple sources and formats and the pace at which content is created, which is becoming more and more unattainable if manual capabilities exists (Rudiansyah, 2023).

Machine learning and decision-making that approaches human intellect are known as Artificial Intelligence (Oyekale, &Zubairu, 2023). In other words AI refers to the intelligent behavior demonstrated by

machines or systems developed by people. It is a branch of computer science that focusses on making computers mimic human intelligences such as learning, reasoning, problem-solving, and natural language comprehension (Zhou, 2023; Chandrashekara & Mulimani, 2024). According to the American Library Association (ALA) (2020), artificial intelligence (AI) is defined as machine learning and natural language processing, which enable computers to carry out certain tasks by examining enormous amounts of data to identify patterns, provide input for predictions, and receive feedback to improve accuracy over time. AI advancements may update, enhance, and supplement a wide range of digital applications, giving them some degree of autonomy without requiring human intervention.

AI is transforming the field of library and information science (LIS) by bringing cutting-edge solutions that improve information management, user experiences, and operational efficiency in libraries and information centres (Mupaikwa, 2024). In the area of IR systems, AI-powered search engines apply machine learning algorithms to increase the accuracy and relevancy of search results. These programmes are able to comprehend user intent, identify patterns in search behaviour, and automate cataloguing procedures by automatically assigning digital resources metadata tags, classifications, and keywords (Sampath et al., 2024; Chandrashekara & Mulimani, 2024). This ensures uniformity in metadata standards and simplifies the arrangement of library collections. A branch of artificial intelligence called machine learning (ML) enables systems to identify patterns in data, thereby enhancing their performance over time (Choi & Lee, 2020). This adaptive learning is particularly valuable in academic libraries, where users often ranging from students, staff, researchers with basic search needs requiring highly specialized information.

Further, Cox, Pinfield and Rutter (2019) posited that libraries can develop IR systems that can not only respond to search queries but also predict users' intentions by using machine learning. This would increase the speed and relevancy of search results. In addition, IR systems can actually read queries more contextually by employing methods like Natural Language Processing (NLP), which allows them detect differences in wording and intent that conventional keyword-based systems might overlook. Davenport and Ronanki (2018) are of the view that NLP enables users to interact with IR systems conversationally, making them accessible to a broader audience and bridging the gap between complex search functionalities and user-friendly interfaces.

The Integration of AI into library IR systems is also addressing a significant challenge of information overload. Traditional systems can no longer handle the vast amount of digital academic content (Fernandez & Osorio, 2020). On the other hand, AI-driven systems are able to classify information hierarchically, analyse large datasets, and provide users with highly relevant results based on intricate algorithms (Jiang & Liu, 2021). For instance, IR systems may now prioritise results according to variables like citation frequency, currency, and cross-referenced topic matter since deep learning algorithms have demonstrated incredible capacity in identifying meaningful patterns in unstructured data. This paradigm shift is particularly impactful in academic libraries, where resources are often interdisciplinary and where research trends evolve rapidly. AI's capacity to recognize and position these complexities provides users an improved search experience, enabling them to find information that is both relevant and

insightful to their specific research needs (Liu & Han, 2020).

Statement of the Problem

Effective information retrieval (IR) is crucial for academic libraries to facilitate seamless access to relevant knowledge resources. Traditional IR systems, including Online Public Access Catalogues (OPACs), have become increasingly inadequate due to the exponential growth of digital content, diverse user needs, and evolving search behaviors. While Artificial Intelligence (AI) has the potential to enhance IR systems by improving search accuracy, automating metadata generation, and enabling personalized recommendations, its adoption in university libraries in Sokoto, Nigeria, remains limited.

Despite the growing global discourse on AI-driven IR systems, there is a lack of empirical evidence on the level of awareness, preparedness, and challenges associated with AI integration in university libraries in Sokoto. Factors such as technological gaps, insufficient expertise, and funding constraints may hinder effective implementation. This study, therefore, seeks to investigate the awareness, readiness, challenges, and strategies for integrating AI into IR systems to enhance library services in university libraries in Sokoto, Nigeria.

Objectives of the Study

1. To identify the extent of awareness of the contribution of AI in enhancing IR systems in university libraries in Sokoto
2. To ascertain the level of preparedness on the integration of AI for enhancing IR systems in university libraries in Sokoto
3. To find out the challenges associated with the integration of AI for enhancing IR systems in university libraries in Sokoto
4. To proffer strategies for actualizing smooth integration of AI for enhancing IR systems in university libraries in Sokoto

Review of Related Empirical Studies

Isiaka et al. (2024) conducted a study on the perceived awareness and usefulness of artificial intelligence technology for efficient library operations in university libraries in Kwara State, Nigeria. Descriptive survey design was adopted for this study, and the population consisted of 108 professional librarians and para-professionals in the university libraries in Kwara state, which are University of Ilorin, Kwara State University Malete, Al-Hikmah University Ojaja, University Eyenkorin, Landmark University, Omu-Aran, and Ahmad Pategi University, Patigi. A total enumeration technique was employed, and a questionnaire was used to collect data from the respondents. Data collected was analyzed using frequency counts and simple percentages. Findings revealed that AI Robots, AI chat-bots, face recognition technology, virtual references, etc. were highly aware of. The findings also showed that there are several obstacles to integrating AI technology into library operations, such as a high maintenance uncertainty, insufficient internet service, technical issues, epileptic electricity or power supply, and inadequate ICT facilities for AI technologies.

To investigate the awareness, adoption, and possible effects of artificial intelligence (AI) on library services, Odigie (2024) conducted a study titled Integration of Artificial Intelligence (AI) in Nigerian University Libraries. The study employs a qualitative approach, utilizing a case study design to capture the perspectives of reference librarians in the north-central geopolitical zone of Nigeria. Data were collected through semi-structured interviews with 52 reference librarians. Thematic approach using narrative discourse was used

in analyzing the data. The findings showed that although reference librarians are quite aware of AI technologies such as Chat GPT and Gemini, they still mainly employ them for their own personal usage rather than providing professional library services. Challenges regarding infrastructure and training hampered the effectiveness of AI's integration into library operations, limiting its ability to assist faculty and students.

Quadri (2024) in his study examined the awareness and adoption of artificial intelligence for effective library service delivery in academic libraries in Kwara state Nigeria. The study adopted the descriptive survey design. The study population consists of 154 library staff in 6 academic libraries in Kwara state Nigeria. The study was restricted to four (4) academic libraries: Federal Polytechnic Offa, Kwara State University, Malete, and University of Ilorin. The questionnaire was used to collect data, and the sample size was 136, drawn from the study's overall population. The data collected in this study were analyzed using Statistical Package for Social Science (SPSS). The study's findings revealed that AI is beneficial to academic libraries for effective library services and operations because it helps to eliminate repetitive and tedious task; it helps to make library services more effective. It was also revealed that academic libraries in Kwara state are yet to integrate AI on library operations and services. Libraries are under-equipped with ICT facilities which are an integral part of AI to function.

Tripathi and Tripathi (2024) conducted a study entitled "The Impact of Artificial Intelligence on Library Services and Information Management." The study employed a comprehensive scale to evaluate the extent of artificial intelligence (AI) integration into libraries, along with the problems faced and the resulting impacts on user experience. The results indicated AI improved effectiveness in the organization and classification of materials, as well as increased user contentment. However, the issue pertaining to data privacy presents considerable obstacles. The study highlighted the necessity of ongoing training for library personnel and stresses the significance of ethical considerations in the incorporation of artificial intelligence. The researchers recommended that libraries should propose avenues for further research, emphasizing the crucial impact of artificial intelligence (AI) on the evolution of library services.

Methodology

A mix method (qualitative and quantitative) approach using Descriptive Survey Design and thematic analysis were used. This is because according to Mole (2019), it aimed at collecting data from members of a given population on their views, attitudes, beliefs, etc. The research design was suitable for this study because the research questions carries interrogative pronoun (What). This, according to Survey Planet (2022), is often used to understand the “What, Who, When, and Where”.The study's population comprised 20 members of the university library management committees, with each of the four selected university libraries contributing five representatives using stratified sampling. The universities were Usmanu Danfodiyo University, Sokoto (UDUS), Sokoto State University (SSU), Shehu Shagari University of Education, Sokoto (SSUES), and North-West University, Sokoto (NWUS). The instruments used for data collection were open-ended questionnaire and semi-structured face-to-face transcribed interview with the library management committee.Data obtained was analyzed using Frequency, and percentages. The average accepted percentage was 50% and any score below the average percentage was

considered rejected. While data obtained from interview was analyzed using thematic approach.

Results and Discussion

Results from the Questionnaire

Research question 1: What is the extent of awareness of the contribution of AI in enhancing IR systems in university libraries in Sokoto?

Table 1: Frequency and percentages of the respondents on the extent of awareness of the contribution of AI in enhancing IR systems in university libraries

S/N	Item statements	N	A	R	Remarks
			Freq. (%)	Freq. (%)	
1	Employing AI algorithms contributes in improving relevancy and accuracy in search of information using machine learning.	20	15(75%)	5(25%)	A
2	AI enables systems to understand user intent and context while searching information which enhances semantic search capabilities using Natural Language Processing (NLP).	20	14(70%)	6(30%)	A
3	AI improves content organization and retrieval efficiency.	20	11(55%)	9(45%)	A
4	AI tailors search results based on user behaviour and preferences, enhancing user experience.	20	13(65%)	7(35%)	A
5	AI expands functionality as it provides results for print and non-print resources.	20	16(80%)	4(20%)	A
6	Employing AI in IR systems resists noise and inconsistencies in data due to its inherent resilience and adaptability, thereby retrieving useful, accurate and reliable information.	20	18(90%)	2(10%)	A
7	AI is scalable to comprehend and manage large and complex data sets.	20	17(85%)	3(15%)	A
8	AI can automatically generate index terms from the document text, facilitating efficient and more accurate search results.	20	19(95%)	1(5%)	A

Key: N= Sample Size, A= Accepted, and R= Rejected

The result presented in Table 1 shows that university library management committees in Sokoto are aware of the contribution of AI for enhancing IR systems with the accepted percentages between 55% and 95% respectively on the 8 items. This concurred with the findings of Isiaka (2024); and Quadri (2024) who found that librarians in university libraries in Kwara State are aware of AI technology and perceived the usefulness of its integration to library operations.

Research question 2: What are the challenges associated with the integration of AI for enhancing IR systems in university libraries in Sokoto?

Table 2: Frequency and percentages of the respondents on the challenges associated with the integration of AI for enhancing IR systems in university libraries

S/N	Item statements	N	A	D	Remarks
			Freq. (%)	Freq. (%)	
1	AI models learn from data, and they might unintentionally inherit biases.	20	12(60%)	8(40%)	A
2	Designing and implementing an AI-based IR systems can be complex, and requires significant expertise in AI	20	15(75%)	5(25%)	A
3	The cost of developing and maintaining AI-based systems could be a financial deterrent especially for developing countries,	20	12(60%)	8(40%)	A
4	Insufficient power supply.	20	16(80%)	4(20%)	A
5	AI systems demand a robust cyber security framework to safeguard sensitive information against potential threats and breaches.	20	14(70%)	6(30%)	A
6	Inadequate user skills.	20	13(65%)	7(35%)	A
7	Poor technology support.	20	6(30%)	14(70%)	D
8	Poor perception on the usability of AI in university libraries by the librarians.	20	17(85%)	3(15%)	A
9	Inadequate internet service provision.	20	6(30%)	14(70%)	D

Key: N= Sample Size, A= Agree, and D= Disagree

The results presented in Table 2 shows that the challenges associated with the integration of AI for enhancing IR systems in university libraries in Sokoto were algorithm bias, complex implementation due to the lack of expertise, insufficient funds, insufficient power supply, among others with the agreed percentages between 60% and 85% respectively on the 6 items. However, the library management committees disagreed with the other 3 items such as high cost, poor technology support and inadequate internet facilities. This is in tandem with Odigie (2024); Quadri (2024); Tripathi and Tripathi (2024) studies who found that lack of expertise, academic library employees have negative attitude toward using ICT to perform library services, data privacy etc. were among the factors mitigating the integration of AI into library operations. However, it is contrary to the findings of Isiaka (2024) who found that epileptic electricity or power supply, inadequate ICT facilities for AI technologies etc. were the challenges associated with integration of AI in university libraries in Kwara state Nigeria.

Results from the Interview

Level of Preparedness on the Integration of AI for Enhancing IR Systems in University Libraries in Sokoto

During the interview, some few members of the university libraries management committees have responded that the university libraries are well equipped and ready to integrate AI in their IR systems. However, overwhelming majority stated that the level of preparedness for the integration of AI on IR systems is at infant stage due to technological gap in terms of infrastructure and skill sets of librarians in the university libraries that require specialized training on AI. The findings is in line with Quadri (2024); Odigie (2024) who found that academic libraries in Kwara state are yet to integrate AI on library operations and services; libraries are under-equipped with ICT facilities, which is an integral part of AI to function.

Strategies for Actualizing Smooth Integration of AI for Enhancing IR Systems in University Libraries in Sokoto

The strategies for actualizing smooth integration of AI for enhancing IR systems as extracted from interview granted by the library management committees were; for libraries to be able to implement AI system, there should be10% allocation of the university's recurrent expenditure as directed by National Universities Commission (NUC) to university libraries which would enable libraries in procuring IT-based equipment that can handle AI system. In addition, there is also need for Tertiary Education Trust Fund (TETFUND) intervention in the project. This would enable university libraries to put in place robust and high-speed internet facilities, maintain rigorous staff training, power back up preferably solar and inverter, etc. This is in tandem with the findings of the Quadri (2024) who found that there should be an improved budget for procuring the ICT equipment, training library personnel, adequate funding for academic libraries in Nigeria among others.

Summary of the Major Findings

1. The study revealed that libraries management committees were fully aware of the contribution of AI in enhancing IR systems in university libraries in Sokoto.
2. The study found that challenges associated with integration of AI for enhancing IR system were algorithm bias, complex implementation due to the lack of expertise, insufficient funds, among others.
3. It was also found that the level of preparedness for the integration of AI on IR systems is at infant stage due to technological gap in terms of infrastructure and skilled sets of librarians in the university libraries that require specialized training on AI.
4. The study found that for university libraries be able to implement the AI system, 10% allocation of the university's recurrent expenditure should go to university libraries as directed by National Universities Commission (NUC) along with TETFUND intervention.

Conclusion

The significance of integrating artificial intelligence (AI) into information retrieval systems has been proven by this study, as it enhances user experience, efficiency, and personalization. Artificial intelligence (AI) tools such as deep learning (DP), machine learning (ML), and natural language processing (NLP) facilitate in the handling of large amounts of digital content, reduce information overload, and provide more accurate search results. According to the findings, libraries management committees were fully aware of the aforementioned contribution of AI in enhancing IR systems

in university libraries in Sokoto. However, the libraries are yet to implement the systems due to lack of technological infrastructure, lack of skilled sets of librarians in the university libraries, insufficient funds etc.

Recommendation

Based on the findings of the study, the following recommendations were made to the relevant stakeholders for consideration:

1. For any library that is willing to implement AI for enhancing IR system should give specialized AI training to its personnel.
2. Libraries should procure AI-technology such as Natural Language Processing (NLP), Machine Learning (ML), Deep Learning (DL), Neural Networks (NN), Generative AI Models (i.e. Chat-GPT, AI robots, Chat-bots etc.) for smooth implementation of AI in IR systems.
3. Universities should comply with NUC directives that 10 allocation of the university's recurrent expenditure should go to university libraries.

References

Adelakun, N.O. (2024). Exploring the impact of artificial intelligence on information retrieval systems. https://informationmatters.org/2024/05/exploring-the-impact-of-artficial-intelligence-on-information-retrieval-systems/?utm_source=perplexity

Aliyu, J.S. & Gadanga, A.T. (2024). Availability and use of educational databases for effective teaching and learning by academic staff. *Record and Library Journal,* 10(2), 235-246. DOI: 10.20473/rlj.V10-I2.2024.235-246.

American Library Association (ALA) (2020). Tools, publications and resources - Artificial Intelligence. http://www.ala.org/tools/future/trends/artificialintelligence

Breeding, M. (2021). The role of artificial intelligence in enhancing library services. *Library Technology Reports,* 57(7), 1-40.

Chandrashekara, G.S. & Mulimani, M.N. (2024). Impact of artificial intelligence on library and information science (LIS). https://www.researchgate.net/publication/381045233

Choi, N., & Lee, J. (2020). AI applications in academic libraries: A review of recent developments. *College & Research Libraries,* 81(5), 749-769. https://doi.org/10.5860/crl.81.5.749

Cox, A.M., Pinfield, S., & Rutter, S. (2019). The intelligent library: Thought and practice in applying artificial intelligence to academic libraries. *The Journal of Academic Librarianship,* 45(5), 102070. https://doi.org/10.1016/j.acalib.2019.102070

Davenport, T. H., & Ronanki, R. (2018). Artificial intelligence for the real world. *Harvard Business Review,* 96(1), 108-116.

Fernandez, M. L., & Osorio, N. L. (2020). Artificial intelligence applications in academic libraries: Opportunities and challenges. *New Library World,* 121(7/8), 465-477.

https://doi.org/10.1108/NLW042020-0031

Hambarde, K.A., & Proenca, H. (2023). Information retrieval: Recent advances and beyond. *Institute of electrical and electronic engineers.* DOI: 10.1109/ACCESS.2023.3295776

Isiaka, A.O., et al. (2024). Perceived awareness and usefulness of artificial intelligence technology for efficient library operations in university libraries in Kwara State, Nigeria. *Journal of Library Services and Technologies, 6(1),* 120 – 134. DOI: http://doi.org/10.47524/jlst.v6i1.121

Jiang, X., & Liu, Y. (2021). Academic libraries and artificial intelligence: A perspective on user experience and technology integration. *Library Hi Tech News,* 38(3), 19-23. https://doi.org/10.1108/LHTN-05-20210030

Liu, Z., & Han, Y. (2020). AI-driven information retrieval in academic libraries: A focus on machine learning and user personalization. *The Electronic Library,* 38(4), 829-846. https://doi.org/10.1108/EL10-2019-0244

Mandil, T. (2009). Artificial intelligence for information retrieval. Encyclopedia of Artificial Intelligence. https://www.igi-global.com/chapter/artificial-intelligence-information retrieval/10240?utm_source=perplexity

Mole, Austin J.C. (2019). Practical Guide to Research in Library and Information Science. Enugu, UNN Press.

Mupaikwa, E. (2024). The application of artificial intelligence for reference purposes in academic libraries. *IGI Global,* 166-192. https://doi.org/10.4018/979-8-3693-15736.ch007

Odigie, I.O. (2024). Exploring the awareness, use and challenges facing the integration of artificial intelligence in library services by librarians in university libraries in North-Central, Nigeria. *Communicate: Journal of Library and Information Science,* 26(1), 211-219

Oyekale, J.O. & Zubairu, A.N. (2023). Assessment of awareness, perceptions, and adoption of artificial intelligence in university libraries in Osun state, Nigeria. *Tin-city Journal of Library, Archival & Information Science,* 12(1).

Quadri, R.F. (2024). Awareness and adoption of artificial intelligence for effective library service delivery in academic libraries in Kwara State Nigeria. *International Journal of Research Publication and Reviews,* 5(1), 656-662. DOI: https://doi.org/10.55248/gengpi.5.0124.0119

Rudiansyah, R. (2023). Artificial Intelligence: Prospects and challenges for library services. Proceeding of the 3rd International Conference on Social Knowledge Sciences and Education (ICSKSE)

2023 *"Change and Continuity in Southeast Asia", Advances in Social Science, Education*. https://doi.org/10.2991/978-2-38476-168-5_28

Sampath, K.K., et al. (2024). The role of artificial intelligence in enhancing information retrieval systems in academic libraries. *Library progress international,* 44(3), 22526- 22541

Tripathi & Tripathi (2024). The Impact of artificial intelligence on library services and information management. Library philosophy and practice (e-journal). https://digitalcommons.unl.edu/libphilprac/8148

Zhou, H. (2023). Research on the development of university libraries in the era of artificial intelligence (AI). *The Frontiers of Society, Science and Technology,* 5(7), 109-113. Doi: 10.25236/FSST.2023.050719