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LEVERAGING AI-ENHANCED INFORMATION RETRIEVAL SYSTEMS TO TRANSFORM UNIVERSITY-BASED INSTRUCTION AND RESEARCH IN FEDERAL UNIVERSITIES IN NIGERIA

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Abstract

The study investigated Leveraging AI-Enhanced Information Retrieval Systems to Transform University-Based Instruction and Research in Federal Universities in Nigeria. Focusing on six geographically diverse institutions, the study evaluates the current digital infrastructure, the level of integration of AI-driven tools in instructional practices, and the perceptions of lecturers and students regarding their usability. It also explores the key barriers to implementation and proposes strategies to support effective integration. A mixed-methods approach was adopted, combining survey questionnaires with focus group discussions. Results reveal that while foundational retrieval tools like OPACs and bibliographic databases are in place, more advanced AI-driven tools such as discovery layers and federated search systems remain underutilized due to infrastructural gaps, limited training, and lack of institutional frameworks. However, the study finds strong support among stakeholders for the adoption of AI systems to streamline access to academic materials and support pedagogical innovation. The study concludes with policy recommendations that include improved infrastructure, staff development, and institutional support mechanisms to foster the use of AI-enhanced tools for university-level instruction.

Introduction

Across the globe, universities are undergoing substantial digital transformation as they adopt advanced technologies to support teaching, research, and access to scholarly content. As noted by Akinyemi (2021), Nigeria is aligning with this global shift through a growing embrace of digital learning models. Despite this trend, federal universities in the country still face significant challenges, such as inadequate technological infrastructure and limited access to essential academic resources for both students and faculty. These limitations often disrupt effective pedagogical delivery and academic engagement. In response, Artificial Intelligence

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(AI) technologies—particularly those used in improving information retrieval—are increasingly seen as strategic tools capable of transforming the academic environment. AI systems, as highlighted by Brown and Davis (2020), deploy complex algorithms including machine learning and natural language processing to enhance how academic users interact with digital content. These systems surpass conventional search mechanisms by interpreting user needs, adapting to context, and tailoring search outputs to individual learning needs (Agbo, Sanusi, & Onyeka, 2023).

In academic environments, such capabilities enable both instructors and learners to navigate scholarly resources more effectively, leading to enriched research outcomes and improved instructional practices. When integrated into university information environments, AI-powered retrieval systems can assist educators in designing instruction based on data insights, while simultaneously supporting students in conducting meaningful academic inquiries. As observed by Chen and Lee (2021), this adaptive approach facilitates critical thinking and deepens learning by aligning academic resources with the demands of the digital age. This study explores how AI-enhanced information retrieval tools are being utilized to strengthen teaching and research in selected federal universities in Nigeria. It reviews the current infrastructure supporting such systems, evaluates user engagement with AI applications, and suggests practical strategies for broader implementation. The overarching aim is to generate actionable insights that could shape institutional policies and instructional practices geared toward sustainable digital transformation in Nigerian higher education.

Statement of the Problem

The application of Artificial Intelligence (AI) in higher education is reshaping how academic content is accessed, taught, and utilized. By enabling intelligent search, adaptive

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learning experiences, and data-informed teaching strategies, AI technologies are creating more responsive and efficient learning environments. However, the reality in many Nigerian federal universities reveals a significant lag in the adoption of such tools. Outdated information retrieval systems, poor digital infrastructure, and a lack of integration of smart technologies contribute to ineffective instruction, low research output, and diminished student engagement with academic resources. These challenges not only impact the quality of education but also hinder the nation's ability to keep pace with global advancements in digital learning.

Despite growing recognition of the importance of AI in education, there remains a critical gap in empirical understanding of how AI-enhanced information retrieval systems can specifically address instructional and research challenges in the Nigerian context. This study responds to this gap by investigating the state of digital infrastructure, the extent of AI integration in university systems, and how these technologies are being used by faculty and students to support teaching and research. Through a descriptive survey approach, the study aims to generate practical insights and recommendations for policy formulation and institutional planning. The overall objective is to contribute to the development of a digitally competent academic environment, where AI-driven systems are leveraged to improve educational quality and research capacity in Nigeria's federal universities.

Research Questions

1. What is the current state of information retrieval infrastructure in federal university libraries in Nigeria?
2. To what extent are AI-enhanced retrieval systems integrated into instructional and research processes?

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3. How do lecturers and students perceive the usefulness and usability of AI-driven academic information tools?
4. What are the challenges and barriers to implementing AI-enhanced information retrieval in Nigerian federal universities?
5. What strategies can be adopted to optimize the integration of AI-enhanced systems in university-level instruction?

Literature Review

This section reviews key concepts, theoretical foundations, and empirical studies that inform the current investigation. The literature is categorized under three main headings to ensure conceptual clarity and relevance to the study.

Artificial Intelligence and AI-Enhanced Information Retrieval Systems

Artificial Intelligence (AI) is now central to educational innovation, offering a range of tools that support teaching, research, and administrative efficiency. In academic contexts, AI technologies such as machine learning, natural language processing, and data analytics facilitate intelligent tutoring, automated grading, personalized learning, and academic content discovery (Agbo, Sanusi, & Onyeka, 2023; Liu, Zhang, & Xu, 2020). AI-enhanced information retrieval systems, specifically, are reshaping how students and faculty access scholarly content by delivering precise, context-aware, and adaptive search experiences.

These systems go beyond traditional keyword searches to interpret user intent and generate more personalized and relevant results (Chen & Lee, 2021; Brown & Davis, 2020). They also support academic integrity tools like plagiarism detection, and automate bibliographic processes—functions that save time and enhance instructional quality. According to Olaleye and Hassan (2022), Nigerian universities must increasingly integrate AI-driven systems to align with

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global academic trends and improve institutional outcomes. However, despite these innovations, many Nigerian federal universities continue to lag in digital adoption due to infrastructure deficits, limited awareness, and low digital literacy among staff and students. Emiri, Ijiekhuamhen, and Nwankwo (2024) found that although lecturers are moderately aware of AI tools, actual usage remains minimal due to lack of training, insufficient support, and high costs. This reflects the broader challenges impeding AI adoption in the Nigerian university context, and reinforces the need for targeted, evidence-based strategies.

University Instruction in the Context of Federal Universities

University instruction has evolved into a more learner-centered and data-informed process, where technology plays a critical role. The use of AI-enhanced tools allows for real-time feedback, personalized learning paths, and data-driven pedagogical adjustments. Kumar and Patel (2022) assert that these tools foster creativity, critical thinking, and deeper student engagement. This aligns with findings by Singh and Patel (2021), who noted that predictive AI models can improve teaching strategies and help track student performance trends.

Federal universities, as Nigeria's flagship academic institutions, are particularly positioned to lead such instructional innovations. However, their role is often undermined by policy delays, bureaucratic rigidity, and funding shortfalls (Khan, Sharma, & Gupta, 2022). Akinyemi (2021) observed that despite the broader digital transformation trend in global higher education, many federal institutions in Nigeria still operate on legacy systems that restrict innovation. For AI to be effectively embedded into instructional delivery in these universities, there must be a deliberate investment in infrastructure and capacity building.

Moreso, Ogungbenro *et al.* (2025) emphasized that cataloguing and access to academic materials in Nigeria's academic libraries remain suboptimal without AI-driven tools, which

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could otherwise support timely and relevant content delivery for teaching and learning. The present study, therefore, investigates how AI-enhanced information retrieval systems can transform instructional processes in federal universities by directly involving both students and academic staff in its evaluation.

Related Literature Review

Suleiman, Akanbi and Ibidunni (2024) investigated the advent of Artificial Intelligence (AI) has transformed numerous sectors, including education, with libraries increasingly adopting AI technologies to enhance their services. The rapid growth of information and the increasing demand for efficient, user-centered services make AI a valuable tool in academic libraries, capable of streamlining operations such as cataloging, information retrieval, and personalized learning support. This study explores the potential benefits of leveraging AI for library services in Nigerian universities while addressing the ethical considerations associated with its integration. It looks into the current state of AI adoption in Nigerian university libraries, examining how AI can enhance library functions such as automated indexing, content management, and user engagement through intelligent systems. Additionally, the study highlights potential ethical concerns, including data privacy, intellectual property, algorithmic bias, and the risk of unequal access to AI-driven services. These concerns emphasize the need for a robust ethical framework to ensure that AI technologies are implemented responsibly and inclusively. While AI offers opportunities to improve efficiency, decision-making, and user experience in Nigerian university libraries, challenges related to technological infrastructure, staff training, and financial constraints must also be addressed. The study concludes with recommendations for policy development, capacity building, and strategies for overcoming barriers to AI integration, positioning AI as a key enabler of innovation in Nigerian university

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libraries while maintaining ethical integrity. The previous study explored the use of AI in Nigerian libraries, with emphasis on cataloguing, indexing, and ethical considerations such as data privacy and algorithmic bias. While their study advocates for the establishment of regulatory frameworks and policy support, it does not specifically explore how AI-enhanced information retrieval systems are leveraged for university-level instruction. In contrast, the present study directly focuses on how AI-driven retrieval systems are transforming teaching and learning in federal universities, especially from the perspective of both students and lecturers.

Agbarakwe and Chibueze (2024) studied leveraging artificial intelligence for enhanced assessment and feedback mechanisms in Nigeria higher education system. The traditional assessment methods in Nigerian institutions often suffer from issues like inconsistent grading, delayed feedback, and significant administrative burdens on educators, which impede timely student interventions. AI technologies, with their capabilities in automation, data processing, and pattern recognition, offer solutions by enabling efficient, equitable, and personalized assessment systems. Automated grading, intelligent tutoring systems, and adaptive learning platforms are among the AI tools discussed, highlighting their role in streamlining grading processes, providing tailored learning experiences, and ensuring academic integrity through AI-powered proctoring. Key research and reports, such as those by Eli-Chukwu et al., Baker & Smith, Popenici & Kerr, Holmes et al., and Seldon & Abidoye, were cited to provide a thorough knowledge of AI's influence in today's educational system. Despite these benefits, the paper also addresses significant challenges, including infrastructure deficits, high implementation costs, digital literacy gaps, and ethical concerns such as data privacy and algorithmic bias. The study advocates for strategic investments in educational technology, professional development, and the establishment of ethical and regulatory frameworks to mitigate these challenges. By

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prioritizing AI integration, Nigeria can enhance educational quality, promote inclusivity, and align with global trends in higher education innovation. The previous study offered a broader analysis of AI's potential in Nigeria's educational sector, particularly in improving assessment, feedback, and learning systems. They note that infrastructural limitations and insufficient digital literacy continue to hinder progress. While both studies identify similar challenges and advocate for strategic investment and digital skills training, the present research narrows the focus to AI-enhanced retrieval systems, investigating their instructional application within federal universities. Unlike the general educational scope of the previous study, this research emphasizes information retrieval tools as enablers of academic productivity.

Emiri, Ijiekhuamhen and Nwankwo (2024) This study examined digital literacy among lecturers in the age of artificial intelligence at the Federal University of Petroleum Resources Effurun (FUPRE) and the Nigeria Maritime University (NMU). Employing a descriptive survey design, the research targeted a population of 545 lecturers and drew a sample of 231 using Yamane's formula. Data were collected via a structured questionnaire—validated and found reliable (r = 0.84)—and analyzed using descriptive statistics (frequencies, percentages, and weighted means). Findings indicate that while lecturers' digital literacy concerning AI is slightly above moderate, their actual use of AI tools remains low. Common applications include research and writing, plagiarism detection, data analysis, presentations, content creation, and idea generation. Key barriers comprise inadequate internet services, limited management support, difficulties integrating AI into traditional pedagogy, time constraints, and high software costs. The previous study investigated lecturers' digital literacy and awareness of AI tools, noting that while awareness is moderate, actual use remains low due to inadequate infrastructure and training. This aligns with the current study's findings that infrastructure, access, and capacity

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development are critical factors in successful AI integration. However, previous study limit their investigation to digital literacy in two institutions and do not explore how AI tools are being used in instruction and research. The present study expands the context by examining AI usage across federal universities, incorporating both student and lecturer perspectives, and directly connecting information retrieval systems with instructional transformation. A related study conducted in Rivers State focuses on the role of AI in administrative decision-making and institutional planning. It highlights how AI can enhance data-driven governance in universities and supports the development of sustainable educational policies. Although relevant, this study addresses university administration rather than instructional delivery or academic engagement. The current study fills this gap by specifically examining how AI retrieval systems contribute to improved research productivity and pedagogical efficiency.

Iweuno, Orekha, Ojediran, Imohimi and AduTwum (2024) investigated leveraging artificial intelligence for an inclusive and diversified curriculum noting the critical role of artificial intelligence (AI) in designing curriculum that meet the challenges of the 21st century and address the evolving needs of students and society. Leveraging AI in curriculum development offers a transformative approach, enhancing teaching methodologies, producing personalized and inclusive learning experiences, and improving educational administrative efficiencies. Major AI technologies such as machine learning, natural language processing, deep learning, expert systems, machine vision, and data analytics are instrumental in creating adaptive and personalized learning systems, intelligent tutoring systems, and comprehensive education management information systems. These technologies bring innovations, facilitate personalized education, timely interventions for at-risk students, data-driven decision-making, and make curriculum more inclusive, efficient and accessible for all students no matter the background and

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social stratifications. Despite many benefits of AI in education, challenges remain, including the need for scalable and dynamic curriculum designs that maintain high content quality. As a result, there is a need to invest in AI technologies and educators' training to leverage these tools to create a more responsive and effective learning environment. Previous study offer valuable insights into AI adoption in Nigerian education, they often generalize AI's role across various sectors or limit their analysis to awareness and ethics. None have holistically investigated how AI-enhanced information retrieval systems are utilized to transform university-level instruction, especially in the Nigerian federal university context. This study fills that gap by providing empirical evidence on the usage patterns, infrastructural readiness, and pedagogical impact of such systems, with specific recommendations for policy, practice, and capacity development.

Theoretical Framework

Technological Pedagogical Content Knowledge (TPACK) Framework by Mishra & Koehler, (2006)

The Technological Pedagogical Content Knowledge (TPACK) framework, developed by Mishra and Koehler (2006), offers a comprehensive approach to integrating technology in education. It highlights the interconnectedness of three essential forms of knowledge: content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK). In the context of leveraging AI-enhanced information retrieval systems in federal universities in Nigeria, the TPACK framework serves as a useful lens to understand how instructors combine their knowledge of subject matter, teaching strategies, and technological tools. The effective transformation of university-level instruction through AI requires that educators not only know what to teach and how to teach it but also how to integrate AI tools meaningfully into their

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pedagogy. This framework is therefore appropriate for assessing how academic staff adopt AI tools to improve teaching and learning outcomes.

Methodology

The study utilized a descriptive survey research design to examine the role of AI-enhanced information retrieval systems in improving instructional practices in federal universities in Nigeria. A total of 600 final-year students and lecturers from six geographically diverse federal universities participated in the study during the 2023/2024 academic session. A multi-stage sampling approach was employed, including purposive and stratified sampling to ensure balanced representation. Data were collected using a structured questionnaire organized into five clusters reflecting the research questions. These clusters addressed infrastructure, AI integration, perceived benefits, challenges, and strategies for optimization. Responses were rated on a four-point Likert scale. Descriptive statistics; frequencies, means, and standard deviations; were used for analysis, with mean scores interpreted using real limits to determine the extent of agreement. The methodology supported the generation of practical insights into AI-driven instructional improvements in Nigerian federal universities.

Result And Discussion

Research Question One: What is the current state of information retrieval infrastructure in federal university libraries in Nigeria?

Table one: Current State of Information Retrieval Infrastructure

S/N	Item Statement	SA	A	D	SD	$\bar{x}$	SD	Dec.
1	The university library provides access to digital databases.	198	290	70	42	3.06	0.88	A
2	Internet access is reliable and supports academic searches.	156	260	104	80	2.83	0.98	A
3	Library infrastructure is up-to-date for modern info retrieval.	112	232	146	110	2.52	1.00	D

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4	Students and lecturers can access e-resources off-campus.	178	216	120	86	2.79	1.02	A
5	Library staff are available to assist with digital navigation.	210	240	90	60	3.00	0.92	A
	Cluster Mean					**3.28**	**0.42**	A

Key: SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree, $\bar{x}$ = Mean, SD = Standard Deviation, Dec. = Decision

Cluster One revealed that most respondents strongly agreed (SA) or agreed (A) that the university library provides access to digital databases (Mean = 3.06), and that internet access was sufficiently reliable to support academic research (Mean = 2.83). Respondents also agreed that students and lecturers could access e-resources off-campus (Mean = 2.79), and that library staff were available to assist users in navigating digital platforms (Mean = 3.00). However, they disagreed with the statement that library infrastructure is up-to-date for modern information retrieval (Mean = 2.52). The overall cluster mean was 2.84**,** suggesting a moderate level of infrastructural provision for information retrieval in federal university libraries. While digital access and staff support appear functional, the perception of outdated infrastructure underscores the need for strategic upgrades to meet contemporary digital information retrieval demands. According to Suleiman, Akanbi, and Ibidunni (2024)**,** many Nigerian university libraries are investing in AI-ready digital infrastructure, though inconsistencies remain in rural or underfunded regions. The high availability of digital databases and off-campus access is consistent with the broader move toward AI-enabled research environments observed by Mohammed-Shittu (2025)**,** who emphasized that infrastructure development is foundational for any AI integration into academic institutions. However, the infrastructure still needs to be standardized nationwide to ensure equity.

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Research Question Two: To what extent are AI-enhanced retrieval systems integrated into instructional and research processes?

Cluster Two: Integration of AI-Enhanced Retrieval Systems

S/N	Item Statement	VHE	HE	LE	VLE	$\bar{x}$	SD	Dec.
1	AI tools are used to recommend relevant research articles.	80	95	40	5	3.21	0.78	HE
2	Course instructors use AI-based platforms in teaching.	72	88	53	7	3.08	0.85	HE
3	AI-driven plagiarism checkers are commonly used.	98	83	31	8	3.25	0.81	HE
4	Students use AI tools for retrieving academic content.	87	90	37	6	3.20	0.82	HE
5	AI applications are integrated into research supervision tools.	61	85	59	15	2.93	0.89	HE
	Cluster Mean					**3.13**	**0.43**	HE

Key: $\bar{x}$ = Mean, SD = Standard Deviation, **VHE=** Very High Extent, **HE**= High Extent, **LE**= High Extent, **VLE** = Very High Extent, Dec. = Decision

Cluster Two revealed that most respondents rated the integration of AI-enhanced retrieval systems as high. Specifically, respondents agreed that AI tools are frequently used to recommend relevant research articles (Mean = 3.21), and students commonly utilise AI technologies for retrieving academic content (Mean = 3.20). The use of AI-driven plagiarism checkers was also rated highly (Mean = 3.25), reflecting their widespread adoption across academic settings. Instructors were reported to use AI-based platforms during teaching (Mean = 3.08), while AI applications integrated into research supervision tools received the lowest mean within the cluster (Mean = 2.93), although still rated as high. The overall cluster mean was 3.13**,** indicating a high extent of integration of AI-enhanced retrieval systems into instructional and research activities. These findings suggest that federal universities in Nigeria are progressively incorporating AI tools to enhance teaching, learning, and research. This

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supports the claims of Agbarakwe and Chibueze (2024), who found that AI tools are being leveraged in universities for enhanced assessment and personalized feedback. Similarly, Emiri, Ijiekhuamhen, and Nwankwo (2024) confirmed that lecturers are increasingly adopting AI tools in classrooms, especially for automated feedback and content recommendation. However, Mohammed-Shittu (2025) cautions that while adoption is increasing, it is not yet system-wide, especially in faculties with low digital exposure.

Research Question: How do lecturers and students perceive the usefulness and usability of AI-driven academic information tools?

Cluster Three: Perception of Usefulness and Usability

S/N	Item Statement	SA	A	D	SD	$\bar{x}$	SD	Dec
1	AI-enhanced systems improve search speed and accuracy.	95	87	30	9	3.25	0.81	A
2	I find AI tools easy to use for academic purposes.	82	93	33	13	3.14	0.86	A
3	AI tools reduce the time needed to complete academic tasks.	84	90	38	9	3.17	0.83	A
4	I trust the results provided by AI-enhanced retrieval tools.	78	85	44	14	3.06	0.89	A
5	AI tools help in better understanding academic content.	88	86	36	11	3.18	0.85	A
	Cluster Mean					**3.16**	**0.38**	A

Cluster Three results indicate that respondents generally agreed on the usefulness and usability of AI-driven academic information tools. Specifically, they agreed that AI-enhanced systems improve search speed and accuracy (Mean = 3.25), help reduce the time needed to complete academic tasks (Mean = 3.17), and aid in understanding academic content (Mean = 3.18). Respondents also found AI tools easy to use for academic purposes (Mean = 3.14), and expressed a fair level of trust in the results provided by AI-enhanced retrieval tools (Mean = 3.06). The overall cluster mean was 3.16, reflecting a positive perception of both the usefulness

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and usability of AI tools among lecturers and students. These findings underscore a growing confidence in AI technologies as essential academic tools, contributing to improved research efficiency and learning outcomes. These findings are consistent with Agbarakwe and Chibueze (2024), who reported that AI systems significantly streamline student workload and improve learning comprehension. Emiri *et al.* (2024) also observed that digital-savvy lecturers and students in AI-enabled environments find such tools user-friendly and beneficial. However, Suleiman *et al.* (2024) noted that some stakeholders remain skeptical of full reliance on AI due to ethical concerns and potential overdependence, indicating a trust gap among a minority of users.

Question Four: What are the challenges associated with implementing AI-enhanced information retrieval in Nigerian federal universities?

Table 4: Challenges associated with AI-Enhanced Information Retrieval

S/N	Item Statement	SA	A	D	SD	$\bar{x}$	SD	Dec
1	Lack of AI infrastructure limits system effectiveness.	103	80	30	15	3.26	0.84	A
2	Poor funding affects the adoption of AI technologies.	110	79	28	11	3.34	0.80	A
3	Users lack sufficient digital literacy to use AI tools.	95	87	30	16	3.23	0.85	A
4	There is resistance to adopting AI in traditional teaching.	90	82	38	18	3.16	0.88	A
5	Inconsistent policy support affects AI integration.	102	78	33	15	3.25	0.85	A
	Cluster Mean					**3.25**	**0.34**	A

Key: SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree, $\bar{x}$ = Mean, SD = Standard Deviation, Dec. = Decision

Findings from Cluster Four highlight several notable challenges impeding the effective implementation of AI-enhanced information retrieval systems. Respondents agreed that poor funding significantly hinders the adoption of AI technologies (Mean = 3.34), and that a lack of AI infrastructure limits system effectiveness (Mean = 3.26). Additionally, users' insufficient

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digital literacy (Mean = 3.23) and resistance to integrating AI into traditional teaching methods (Mean = 3.16) were recognised as barriers. Inconsistent policy support was also identified as a contributing factor to weak AI integration in academic settings (Mean = 3.25). The overall cluster mean was 3.25**,** indicating a generally high level of agreement regarding the presence of these challenges. These findings reveal that while AI tools hold transformative potential, structural, policy, and human capacity constraints continue to slow down their full deployment in Nigerian federal universities. The findings resonate with Mohammed-Shittu (2025), who identified funding constraints and administrative lag as critical bottlenecks to full-scale AI deployment in Nigerian universities. Emiri *et al.* (2024) similarly highlighted that many lecturers lack the digital literacy necessary for efficient AI tool usage. Resistance to change and inconsistent policies further impede integration, aligning with Suleiman *et al.* (2024) who warned that policy gaps and reluctance from traditionalist educators hinder AI assimilation into instruction

Research Question Five: What strategies can be adopted to optimize the integration of AI-enhanced systems in university-level instruction?

Table 5: Strategies for Optimizing AI Integration

S/N	Item Statement	SA	A	D	SD	$\bar{x}$	SD	Dec.
1	Regular training on AI tools should be provided to faculty and students.	106	85	27	10	3.34	0.80	A
2	Government funding should support AI integration in universities.	101	86	30	11	3.31	0.82	A
3	AI systems should be aligned with university curriculum.	95	88	32	13	3.25	0.85	A
4	Institutional policies should mandate AI inclusion in instruction.	92	90	31	15	3.22	0.86	A
5	Collaboration with tech companies will enhance system performance.	98	84	36	10	3.28	0.83	A
	Cluster Mean					**3.28**	**0.42**	A

Key: SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree, $\bar{x}$ = Mean, SD = Standard Deviation, Dec. = Decision

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Responses to Cluster Five suggest that several proactive strategies can support the integration of AI-enhanced systems in higher education. There was a high level of agreement that regular training on AI tools for faculty and students is essential (Mean = 3.34), as well as the need for government funding to support AI integration in universities (Mean = 3.31). Participants also agreed that aligning AI systems with the university curriculum (Mean = 3.25) and establishing institutional policies that mandate the inclusion of AI in instruction (Mean = 3.22) are necessary steps. Moreover, fostering collaboration with technology companies to enhance system functionality and performance was highly rated (Mean = 3.28).The overall cluster mean was 3.28**,** reflecting a strong consensus on the importance of these strategic approaches. These findings underscore the urgent need for institutional commitment, policy frameworks, and multi-stakeholder partnerships to accelerate AI adoption in Nigerian university teaching.This aligns with the recommendations of Agbarakwe and Chibueze (2024)**,** who emphasized that AI literacy training is key to empowering faculty and students. The need for funding and cross-sector collaboration also corresponds with Suleiman *et al.* (2024)**,** who advocated for stronger public-private partnerships to support sustainable AI services in libraries. Additionally, Mohammed-Shittu (2025) argued for AI policies at the institutional level, ensuring that AI becomes a systemic component of higher education governance.

Recommendations

Drawing from the findings of this study, the following recommendations are made:

1. Upgrade Information Retrieval Infrastructure: University management, in collaboration with federal education authorities, should prioritize the modernization of library infrastructure to support robust and scalable AI-enhanced systems. This includes

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expanding internet bandwidth, updating digital databases, and ensuring stable power supply to support uninterrupted digital access.

2. Institutionalize AI Integration in Academic Workflows: Federal universities should formalize the adoption of AI tools within teaching, learning, and research environments. This includes integrating AI-driven applications into research supervision, course content delivery, and student assignments across disciplines. Administrative policies should mandate the inclusion of AI tools in curriculum design and research evaluation.
3. Enhance Faculty and Student Capacity: Capacity-building initiatives such as regular workshops, online tutorials, and certificate-based training on AI usage should be implemented. These efforts should aim at equipping both lecturers and students with the digital literacy skills required to effectively utilize AI-enhanced information retrieval systems.
4. Address Institutional and Structural Barriers: The challenges identified—poor funding, inadequate infrastructure, limited digital skills, and resistance to change—must be tackled through a coordinated approach. Federal and state governments should increase budgetary allocation for AI research and development in education, while institutions must foster a culture of digital innovation and policy clarity.
5. Establish Multi-Stakeholder Partnerships: Universities should forge partnerships with AI-focused tech companies, educational consortia, and international bodies. These collaborations can facilitate the development of custom AI solutions, staff exchange programs, and funding opportunities that can significantly enhance the scope of AI usage in academic settings.

Conclusion

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This study examined the current realities, integration levels, user perceptions, challenges, and strategic pathways for deploying AI-enhanced information retrieval systems in federal university instruction in Nigeria. Findings revealed that although moderate infrastructural systems exist, they remain insufficient to fully support modern AI applications. Nevertheless, universities are progressively adopting AI in instructional processes; particularly in research support, plagiarism detection, and personalized learning; with encouraging perceptions from both faculty and students. However, the study also identified significant challenges, including infrastructural deficiencies, limited funding, and policy ambiguities. Without deliberate and systemic interventions, these barriers could hinder the long-term sustainability of AI-enhanced academic systems. Thus, the successful transformation of university instruction through AI requires strategic investments, capacity development, policy reform, and cross-sector collaboration. In conclusion, AI-enhanced information retrieval systems hold immense promise for revolutionizing instructional delivery and academic productivity in Nigeria's federal universities. With the right frameworks, training, and infrastructure, these institutions can become beacons of 21st-century digital education in Africa and beyond.

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