International Journal of Information Resource Management (IJIRM)
Volume 3, Number 4 (October, 2026)
E- ISSN: 1118-7786

CHALLENGES AND ENHANCEMENT STRATEGIES FOR IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE IN ACADEMIC LIBRARIES IN ENUGU STATE, NIGERIA

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Abstract

Artificial Intelligence is transforming library operations by enhancing information retrieval, automating routine services, and improving user experience. However, its implementation in academic libraries in Nigeria remains constrained by several institutional and technological factors. Anchored on Technological Acceptance Model (TAM), the study adopted a descriptive survey research design. The population comprised 78 librarians from five state-owned tertiary institution libraries in Enugu State. A census sampling technique was employed, while data were collected using a researchers-developed questionnaire titled Challenges and Enhancement Strategies of AI Implementation Questionnaire (CESAIIQ). 75 valid copies of the questionnaire, representing a 96.15% response rate, were returned and analyzed using mean and standard deviation. The findings revealed six (6) major challenges, nine (9) prospects and six (6) enhancement strategies of AI implementation in academic libraries in Enugu State, Nigeria with the cluster means of 3.45, 3.68, and 3.89 respectively. The study recommends increased funding, strengthened ICT infrastructure, continuous professional development,

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and collaborative partnerships to promote AI-driven library services in tertiary institutions.

Keywords: Artificial Intelligence, Academic Libraries, AI Implementation, Library Services, Tertiary Institutions.

Introduction

One of the major challenges of libraries, especially those owned or managed by government and/or its institutions in developing countries like Nigeria, is their lassitude towards embracing new technologies or innovation, which is deeply rooted in paucity or rather inadequate funds allocated to them by the government. Moreover, diversion of the library funds by the parent institutions to another department they feel their own needs are primacy is also part of the major problems. From time immemorial, these have been a problem of libraries, commencing from the advent of computers. It is not arguable that it took librarians of that era and libraries of the developing countries a whole lot of time before they embraced the use of computers in the quotidian operations of the library. Many clamoured that libraries are bereft of fund to purchase the computers while some feared that computer has come to take their jobs away from them according to Echedom and Okuonghae, (2021); yet were oblivious that all that is required of them was to learn computer skills and jettison technophobia to thrive in the era of computer. Zondi et al (2024) posit that librarians in developing countries harbour perceptions about AI

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threatening job security due to a paucity of understanding and necessary technological skills. Considering what has happened in the past and what is transpiring today in the modern-day library, it is visible to the blind that libraries are slow to adopt innovation (Wheatley & Herviex, 2019); they frequently delay for the technology to flood the market before being given approval.

Moreover, how computer technologies assist the librarians in discharging their duties in the library effectively, efficiently, and creditably as well as how indispensable it is for academic libraries to use it to render seamless services for its patrons, is a testament that it has come to argument rather than to take away their jobs as perceived by the librarians of that era (Ogwo, Ibegbulem, & Nwachukwu, 2023).The epidemic integration of Artificial Intelligence (AI) into different sectors has etched a colossal transformation in how services are delivered, and academic libraries are no exception. The earlier librarians understand that AI has come to stay and champion its integration in the daily activities of the library, the better for us. For in-depth comprehension, this paper explicitly defined, analyzed and reviewed literatures on concepts or variables such as artificial intelligence and academic libraries.

Academic libraries are libraries of tertiary institutions such as university, polytechnics, colleges of education, health, nursing and so on, that are established to aid teaching, learning and research. It renders services to students, lecturers, researchers and

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other members of the academic community through providing access to books, journals, and electronic database as well as assists them to find, evaluate and utilize information effectively (Zondi et al, 2024). According to Olayode (2022) academic library is vital part of higher education because they facilitate intellectual development, professional networking, knowledge creation, scholarly communication and assist in executing the objective of the institution. In developed countries, according to Wheatley, and Hervieux (2019) academic libraries have undergone substantial transformation; evolving from analogy operation to the adoption of emerging technologies to improve library utilization and information access, enhance service delivery and support teaching, learning and research through the use of AI.

Artificial Intelligence is transforming academic libraries by automating daily activities, enhancing information retrieval, supporting research activities, and improving client services. Massis (2018) opined that AI is a part of computer science that deal with giving the ability to the machines to look as if they have natural human intelligence. It is the development of computer systems capable of performing tasks that normally require human intelligence such as learning, reasoning, problem-solving, language processing, and decision-making (Uwadia, 2022). AI based OCR tools like Tesseract and ABBYY FineReader, and image recognition platforms like Google Vision AI, are already transforming how libraries manage and serve information.

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AI tools are used to perform different functions in various sections of the academic library. AI tools such as Chatbots (Ask-a-librarian, LibAnswers, and LIBot) can handle routine queries on library hours, book availability or account status while virtual assistants such as Amazon Alexa or Google Assistant can offer voice-activated search and navigation support when integrated into library systems (Michalak, 2024; Concha et al., 2024). Moreover, Humanoid robots welcome patrons, retrieval of books or pick books from library shelves (Harada, 2019; Tella, 2020). They further opined that drones equipped with AI-powered cameras can monitor library environments etc. However, the present state of library operations in academic libraries in Enugu State reflects limited AI integration despite the growing influence of digital innovation in modern library operations.

Statement of Problem

A major concern in academic libraries of state tertiary institutions in Enugu State is the increasing demand for innovative and efficient library services in an era driven by digital technologies. Although Artificial Intelligence (AI) has demonstrated significant potential in enhancing information retrieval, cataloguing, user support, and administrative operations, its full implementation in these libraries remains limited. Challenges such as inadequate ICT infrastructure, insufficient funding, lack of technical expertise, resistance to technological change, and concerns about data privacy and ethics hinder effective AI adoption. Consequently, many libraries are unable to fully exploit AI technologies to

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improve service delivery and support academic activities. Despite the promising prospects of AI in transforming library operations and enhancing user satisfaction, there is limited empirical evidence on the specific challenges and opportunities associated with its full implementation in state tertiary institution libraries in Enugu State. This study therefore seeks to investigate these challenges and prospects with a view to providing strategies for effective AI integration.

Research Questions

1. What are the challenges associated with the implementation of Artificial Intelligence in academic libraries in Enugu State, Nigeria?
2. What are the prospects of Artificial Intelligence implementation in academic libraries in Enugu State, Nigeria?
3. What are the enhancement strategies that can be adopted to facilitate the effective implementation of Artificial Intelligence in academic libraries in Enugu State, Nigeria?

Theoretical Framework

The study is grounded in the Technology Acceptance Model (TAM) developed by Davis (1989). TAM proposes that perceived usefulness and perceived ease of use are central determinants of users' acceptance of information technology. Perceived usefulness refers to the extent to which an individual believes that using a technology will improve job

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performance, while perceived ease of use concerns the extent to which the technology is perceived as requiring little effort.

TAM is relevant to AI implementation in academic libraries because librarians' willingness to adopt AI may be influenced by whether they believe AI will improve library operations and whether they believe they possess the ability and resources required to use it. In the present study, perceived usefulness is reflected in the prospects identified by respondents, including improved retrieval, research support, accessibility, personalization, and operational efficiency. Perceived ease of use is related to the availability of technical skills, training, infrastructure, reliable connectivity, and supportive implementation conditions. Resistance to technological change can therefore be understood as an acceptance-related barrier, while training and capacity building can reduce perceived difficulty.

Literature Review

Academic Libraries

Academic libraries are libraries established in tertiary institutions such as university, polytechnic and colleges of education etc. to serve students and faculties of their parent institutions. They provide comprehensive informational services to aid teaching and learning process as well as proffering support for research activities (Bakiri et al., 2023).

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One of their major functions is to support teaching, learning and research of the students, academic and non-academic staff of the institution. They equally extend their services to the host communities to promote town and gown relationship. According to Okafor, Igbokwe and Orsu (2023) their collections can range from a few thousands carefully selected volumes of books to millions of volumes depending on the size of the library and the resources available to them (human, capital and space). These libraries provide an electronic platform for users to easily access a wide range of information through text, video, audio, and other digital resources (Bakiri et al., 2023). Academic libraries provide computer, internet facilities and subscribe to online databases to assist the users to access useful online resources (Okafor et al., 2023). They further stated that other functions include making information resources available to patrons and organizing them for easy retrieval.

Furthermore, the academic libraries of state tertiary institutions in Nigeria serve as vital information hubs of teaching, learning and research. They are pressured due to the information needs of the ever-growing and tech-savvy student population in their institutions. Olayode (2022) opined that the need for innovation has never been more pressing, especially in the dawn of the COVID-19 pandemic, which uncovered the lapses of traditional library systems and advanced the global shift towards digital transmogrification. The application of AI in academic libraries of state tertiary institutions

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in developing countries could help address the ever increasing information needs of these digitally literate students, yet the road to its actualization is filled with multiple barricades and potholes. Some of the glaring impediments, according to Okezie and Anyaoku (2020), include poor infrastructure, inadequate funding, paucity of skilled personnel, data privacy concerns, and resistance to change among library staff and users. Additionally, the digital divide and limited technological awareness among stakeholders, especially in state tertiary institutions, often contribute to budgetary constraints. Similarly, lack of policy frameworks and strategic planning at institutional and government levels to guide the ethical and sustainable adoption of AI in academic environments are no exception.

Artificial Intelligence

Although there is a comprehension that AI is a computer system developed to imitate human intelligence, the fact remains that it transcends (Wheatley & Herviex, 2019). According to Russell and Norvig (2020), AI is a multidisciplinary area of computer science targeted at designing systems that execute tasks requiring human-resembling intelligence. The objectives are: thinking, acquiring knowledge, problem-solving, perception, and language apprehension. Artificial Intelligence is a model that tries to design or proffer a solution by copying human intelligence, such as the power of thinking or reasoning and logical behaviour (Asemi, Ko, & Nowkarizi, 2020). Bakiri, Mbembati and Tinabo (2023) posit that the integration of AI in academic libraries is fueled by the zeal to transform

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traditional libraries to smart libraries. As AI technology grows continuously, they buttressed that many scholars believe that AI could have a positive impact on library service delivery. AI technologies such as machine learning, natural language processing, and robotics are re-moulding library services, from information retrieval and organization to patron interaction and resource management (Shen, 2020). Conversely, the adoption and full implementation of AI in academic libraries of public tertiary institutions within developing countries, Nigeria inclusive, remain limited due to diverse structural, technical, and socio-economic constraints (Oyelude, 2021).

Even with all the numerous challenges, the flame of prospects for AI integration in Nigeria's academic libraries is still burning. AI can radically change library services by enabling intelligent search systems, digitizing cataloguing, classification and indexing, complementing digital reference services, and providing predictive analytics for better decision-making. According to Olayode (2022), Artificial intelligence can make library duties easier, improve the efficiency of library staff, and facilitate impressive service delivery to the new generation of library clients. He further stated that the literature revealed the University of Lagos library as the only academic library in the whole of Nigeria that has competently accepted and implemented AI for library service. However, it is pertinent to explore not only the challenges but equally the enabling factors that could support a fruitful transition towards AI-adaptive library systems. Oyelude (2021)

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postulated that policy development, capacity building, investment in digital infrastructure, and partnerships with technology firms and international development agencies are the visible factors that could support the achievement of AI-driven library systems. Artificial intelligence, with its potential to improve the effectiveness of the library, patron satisfaction, and service delivery, epitomizes a pivotal tool in this transformation. AI can help libraries expand and innovate their services, while equally advocating for their relevance in the contemporary digital world (Olayode, 2022). Nonetheless, the track toward its implementation in academic libraries of public tertiary institutions in Enugu State, Nigeria, is fraught with challenges.

Challenges of AI Implementation in Academic Libraries in Nigeria

The emergence of artificial intelligence into academic libraries holds tremendous promise for improving library services. Conversely, the implementation of AI is not without considerable impediments. These barricades cut across technological, financial, ethical, and human resource aspects.

1. Inadequate Funding: The adoption of AI in academic libraries calls for gigantic financial investment in infrastructure, software, hardware, and incessant maintenance (Bakiri, Mbembati & Tinabo, 2023). Nevertheless, due to inadequate budgetary allocation to academic libraries in developing countries, it becomes cumbersome for them to put AI first

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among other pressing needs (Okezie & Anyaoku, 2020). According to Yusuf et al (2022), contemporary libraries in developing countries float in a financial limbo, lacking the ability to reveal their worth without additional funding. Without sustainable funding models, the full AI implementation in academic libraries, especially in developing countries like Nigeria, will remain a dream.

2. Resistance to Change among Library Staff: The fear among some of the librarians that AI may snatch their jobs from them hinders the AI implementation in Academic libraries. Ifijeh and Yusuf (2020) stipulated that some librarians perceive AI as a threat to the traditional values and roles of the library, leading to scepticism and low implementation. AI technologies can digitize daily activities and services of the library, such as referencing services, cataloguing, collection management, and so on, which could lead to reduced staff needs and job displacement (Ogwo, Ibegbulem, & Nwachukwu, 2023). There is growing concern among librarians, especially in developing countries, about job displacement due to the rise of AI (Ajani et al., 2022). In the same vein, they further opined that there is a paramount concern about job security, as many fear that AI tools could replace human roles, leading to job losses and substantially reducing employment opportunities. The fear that artificial intelligence may replace human jobs remains one of the main reasons for librarians' reluctance to embrace new technologies.

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3. Infrastructure Inadequacy: In developing countries, limited and unreliable infrastructures pose a great challenge to AI implementation in academic libraries of public tertiary institutions in Nigeria. To benefit largely from AI services, academic libraries need to invest in physical equipment, software and supporting infrastructure (Srikanth & Kumar, 2023). According to Olayode (2022) effective AI deployment in Academic libraries is highly dependent on adequate power supply, uninterrupted internet connectivity, and modern computer facilities, which are often not obtainable in the academic library environment, especially in public tertiary institutions in most developing countries. The cost of purchasing, upgrading and maintaining of AI technologies pose a severe barrier (Barsha & Munshi, 2023). Without the prerequisite infrastructure, a well-designed AI solution cannot even function optimally.

4. Data Privacy and Ethical Concerns: AI systems mainly rely on large datasets such as user behaviour and personal information to deliver personalized services. This raises concerns about how patron data is collected, stored, and used. AI systems collect and scrutinize data, which may give rise to distress about their erroneous use (Akinyemi, 2023). Libraries need to navigate issues of consent, algorithmic bias, and implement data protection protocols, all of which require stipulated policies and regulatory frameworks (Cox et al., 2019). According to Praveenraj et al (2025), the library must ensure strict

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adherence to data protection regulations such as the General Data Protection Regulation (GDPR) when implementing AI system.

5. Lack of Technical Expertise among Library Staff: Artificial intelligence requires a degree of digital literacy and understanding that goes beyond traditional librarianship. Contemporary librarianship requires staff with ICT and technical skills to be able to meet the avalanche of information needs of the modern library users. However, when library professionals lack these skills, it poses a drastic challenge in efficient integration and the implementation of AI in academic libraries in Nigeria (Ogwo, Ibegbulem, & Nwachukwu, 2023). In the same vein, Ifijeh and Yusuf (2020) opined that most library staff has little or no training in AI and data science, making it cumbersome to implement and manage AI technologies effectively. The shortage of skilled personnel encumbers both the development and optimal use of AI-driven services in the library.

Prospects of AI Implementation in Academic Libraries in Nigeria

Artificial intelligence (AI) has swiftly transformed various sectors, including education and library services. In Nigeria, the implementation of AI in academic libraries holds huge potential to transform library operations, enhance service delivery, and improve user experience. The desire to propose new services is trending among librarians as technology is transforming client expectations (Olayode, 2022).He stressed that the

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COVID-19 pandemic served as an eye-opener, as many librarians around the world began to understand the importance of innovative technologies in effective library service delivery. Ridge (2019) revealed that enhancing user experience, optimal library operations, collecting updated descriptive metadata as a by-product from the project and outcome, creating collaboration, mastering procedures and digitization, as well as upgrading systems are the prospects or benefits of AI implementation in the library. As academic libraries strive to remain germane in the modern age, embracing artificial intelligence technologies proffers prospects which will be discussed below:

1. Improved Efficiency in Routine Library Operation: One of the main prospects of AI implementation is the automation of library routine operations to enhance efficiency. AI-powered systems can automate cataloguing, classification, indexing and retrieval processes, thereby reducing human mistakes, tedious work and saving time. With AI in the academic libraries, the 4th law of librarianship, "save the time of the reader" will be strictly adhered to and effectively implemented. AI chatbots can also be deployed to avail round the clock digital reference services, assisting users with queries in real-time with human interference (Ugah & Okoro, 2022). According to Ifijeh and Yusuf (2020), intelligent tools such as machine learning algorithms and natural language processing (NLP) can augment metadata generation and facilitate search accuracy in the Online Public Access Catalogue (OPAC). They further buttressed that AI tools can simplify cataloguing processes by

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utilizing machine learning algorithms that understand and apply metadata standards. This could be specifically useful in Nigeria, where most libraries face staff deficiency and inadequate resources.

2. Supplement Academic Integrity and Research Output: The rise of digital technology and pressure to publish has led to increased academic theft, cheating and plagiarism (Waghid & Davids, 2019). AI can complement academic integrity and research output by infusing plagiarism detection systems, automated referencing, and recommendation systems (Filson & ATuase, 2024). Academic libraries in Nigeria can leverage AI to help library clients or researchers in decoding relevant literature, identifying potential collaborators, and maintaining ethical research practices. AI can equally be incorporated into institutional repositories to facilitate automated content analysis, plagiarism detection, and trend identification in research output (Edewor et al., 2021). This can help to improve the global visibility and credibility of research institutions in Nigeria.

3. Enhance Resource Discovery, Accessibility, Inclusivity, and Personalized Services: AI enhances resource discovery by helping library users find salient content they might have otherwise overlooked. It also proffers clientele with disabilities equal rights to library materials by changing printed resources into formats that are accessible for people with disabilities, such as text-to-speech or audio description for images (Akinyemi, 2023). This is in tandem with the library's mission of granting every user, regardless of ability and

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language preferences, access to knowledge. Text-to-speech and speech-to-text give assistance to patrons with visual and hearing impairment (Zurru et al, 2024). Additionally, AI tools can analyze user behaviour and preferences to recommend relevant resources, thereby improving user engagement. It can also enhance information retrieval through intelligent search tools and chatbots. These tools can understand user queries more effectively than traditional search engines, providing personalized and contextually relevant responses. According to Nnadozie et al (2021), an AI-enabled library system can analyze a library user's search history and suggest materials based on their academic interests. For researchers and students navigating gigantic and complex digital repositories, such will be of great importance as it will enhance the user experience.

4. AI-driven Analytics can Support Evidence-based Decision-making in Library Management: This can help by analyzing data on resource usage; clientele satisfaction, and service delivery, library administrators can allocate resources more strategically and enhance services. It is in the same track with global trends in intelligent libraries, where data-driven insights guide policy formation and operational efficiency (Okike & Adetoro, 2019). Han (2021) posits that AI can assist with data collection and analysis so that management decisions about libraries can be stress-free for librarians. He argues that mixing AI with human intelligence can yield a more intelligent and successful library management system.

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5. Digital Preservation and Content Management: Academic libraries can leverage AI technologies to digitize, organize, secure and preserve rare or friable materials, ensuring longevity in access and retrieval. Artificial intelligence can safeguard library environments and its materials by using machine learning and surveillance technology to decipher aberrant behaviour and signal staff about possible threats or dangers (Akinyemi, 2023). Intelligent library tools can discover and repair digital corruptions, classify materials, and maintain data integrity more effectively than traditional systems (Okike & Adetoro, 2019). With AI, the library resource and environment are safe and secure for patrons and staff.

Methodology

This study adopted a descriptive survey research design to investigate the challenges and prospects of full Artificial Intelligence (AI) implementation in academic libraries of state tertiary institutions in Enugu State, Nigeria. The descriptive survey design was considered appropriate because it enabled the researcher to collect data from library personnel and examine their perceptions regarding AI adoption without manipulating any variables. The population of the study consisted of 78 library staff (professional librarians and para-professional librarians) in state-owned tertiary institution libraries in Enugu State. A census sampling technique was adopted to ensure that all eligible respondents participated in the study. Data were collected using a structured questionnaire titled Challenges and Prospects of Full AI Implementation Questionnaire (CPFAIIQ). The

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questionnaire was structured on a four-point Likert scale of Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). The instrument was validated by experts in Library and Information Science. Out of 78 questionnaires administered to the library staff of the 5 state-owned tertiary institutions in Enugu State, 75 copies representing 96.15% were successfully filled and completed. Data collected were analyzed using mean and standard deviation to answer the research questions.

Results

This section covers the result presentation and analysis. The data were analyzed using descriptive statistics. Mean and standard deviation were used to answer the research questions. Tables 1, 2, 3, and 4 present the descriptive analysis addressing the research questions.

Table 1: Demographic Data

Demographic Variables	Category	Frequency (f)	Percentage (%)
Type of Institution	University	54	72.0
	Polytechnic	17	22.7
	College of Education	4	5.3
	Total	**75**	**100.0**
Name of Institution	ESUT	47	62.7
	SUMAS	7	9.3
	IMT	14	18.7
	Enugu State Polytechnics, Iwollo	3	4.0
	ESCET	4	5.3

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	Total	**75**	**100.0**
Education Qualification	PhD	5	6.7
	Masters	18	24.0
	B.Sc.	24	32.0
	HND	15	20.0
	OND	5	6.7
	NCE	8	10.7
	Total	**75**	**100.0**
Years of Experience	1-5yrs	18	24.0
	6-10yrs	26	34.7
	11-15yr	15	20.0
	16-20yrs	13	17.3
	21-25yrs	1	1.3
	26 above	2	2.7
	Total	**75**	**100.0**
Work Status	Professional	29	38.7
	Paraprofessional	46	61.3
	Total	75	100.0
Gender	Male	22	29.3
	Female	53	70.7
	Total	**75**	**100.0**

The demographic data presented in the table 1 indicate that 75 respondents participated in the study. Regarding type of institution, the majority of respondents, 54 (72.0%), were from universities, while 17 (22.7%) were from polytechnics and 4 (5.3%) were from colleges of education. This indicates that university-based respondents constituted the dominant group in the study. However, in terms of name of institution, ESUT had the highest representation with 47 respondents (62.7%), followed by IMT with 14 (18.7%). SUMAS accounted for 7 respondents (9.3%), while ESCET had 4 (5.3%) and Enugu State Polytechnics, Iwollo had 3 (4.0%). Thus, ESUT contributed the largest

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proportion of respondents. Additionally, concerning educational qualification, respondents with a B.Sc. constituted the largest group, with 24 (32.0%), followed by those with a Master's degree, 18 (24.0%), and HND, 15 (20.0%). Those with NCE accounted for 8 (10.7%), while PhD and OND holders each accounted for 5 (6.7%). This suggests that most respondents possessed tertiary-level qualifications, with a substantial proportion holding bachelors and master's degrees.

Moreover, regarding years of experience, the largest proportion had 6–10 years of experience (26; 34.7%), followed by those with 1–5 years (18; 24.0%) and 11–15 years (15; 20.0%). Respondents with 16–20 years constituted 13 (17.3%), while only 1 (1.3%) had 21–25 years and 2 (2.7%) had more than 26 years of experience. Overall, the respondents had considerable work experience. Furthermore, for work status, 46 respondents (61.3%) were paraprofessionals, while 29 (38.7%) were professionals. This shows that paraprofessionals constituted the larger proportion of the respondents. Also, the gender distribution shows that 53 respondents (70.7%) were female, while 22 (29.3%) were male. Therefore, females were considerably more represented than males in the study. Finally, the demographic profile shows that the respondents were predominantly university-based, female, paraprofessional, and holders of bachelor's or master's degrees, with most having between 6 and 10 years of work experience.

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Table 2: What are the challenges associated with the implementation of Artificial Intelligence in academic libraries in Enugu State, Nigeria?

S/N	Items	N	Mean	Std. Deviation	Dec.
1.	Inadequate funding for AI infrastructure and technologies.	75	3.91	.293	Accepted
2.	Shortage of librarians with AI-related skills and competencies.	75	3.25	.902	Accepted
3.	Poor internet connectivity and network instability.	75	3.77	.421	Accepted
4.	Unreliable power supply.	75	3.55	.722	Accepted
5.	Resistance to technological change among library staff.	75	2.81	.954	Accepted
6.	Lack of AI implementation policies and regulatory frameworks	75	3.39	.804	Accepted
	Cluster Mean	**75**	**3.45**	**0.72**	**Accepted**

Table 2 presents the challenges associated with the implementation of Artificial Intelligence (AI) in academic libraries in Enugu State, Nigeria. The results show that the mean scores of the six items ranged from 2.81 to 3.91, with all the values exceeding the decision benchmark of 2.50. This indicates that the respondents generally agreed that inadequate funding for AI infrastructure and technologies (M = 3.91), poor internet connectivity and network instability (M = 3.77), unreliable power supply (M = 3.55), lack of AI implementation policies and regulatory frameworks (M = 3.39), shortage of librarians with AI-related skills and competencies (M = 3.25), and resistance to technological change among library staff (M = 2.81) constitute challenges to the implementation of AI in academic libraries in Enugu State, Nigeria. In terms of ranking, inadequate funding for AI

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infrastructure and technologies was identified as the most prominent challenge, while resistance to technological change among library staff had the lowest mean score, although it remained above the decision benchmark. The cluster mean of 3.45 further indicates that, overall, respondents agreed that the listed factors constitute challenges to the full implementation of AI in the libraries under study.

Table 3: What are the prospects of Artificial Intelligence implementation in academic libraries in Enugu State, Nigeria?

S/N	Items	N	Mean	Std. Deviation	Dec.
1.	Improved efficiency in information retrieval and library services.	75	3.96	.197	Accepted
2.	Enhanced user satisfaction through personalized information services.	75	3.79	.527	Accepted
3.	Automated cataloguing and classification of library resources.	75	3.55	.776	Accepted
4.	Provision of 24/7 virtual reference and user support services.	75	3.31	.870	Accepted
5.	Faster processing and management of library collections.	75	3.59	.548	Accepted
6.	Improved decision-making through data analytics and insights.	75	3.24	.803	Accepted
7.	Increased accessibility to digital library resources.	75	3.87	.414	Accepted
8.	Enhanced research support through intelligent search systems.	75	3.97	.162	Accepted
9.	Reduction in routine and repetitive library tasks.	75	3.80	.545	Accepted

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Cluster Mean	**75**	**3.68**	**0.59**	**Accepted**

Table 3 presents the prospects of implementation of Artificial Intelligence (AI) in academic libraries in Enugu State, Nigeria. The results show that all the nine items had mean scores ranging from 3.24 to 3.97, which are above the decision benchmark of 2.50. This indicates that the respondents affirmed that enhanced research support through intelligent search systems (M = 3.97), improved efficiency in information retrieval and library services (M = 3.96), increased accessibility to digital library resources (M = 3.87), reduction in routine and repetitive library tasks (M = 3.80), enhanced user satisfaction through personalized information services (M = 3.79), faster processing and management of library collections (M = 3.59), automated cataloguing and classification of library resources (M = 3.55), provision of 24/7 virtual reference and user support services (M = 3.31), and improved decision-making through data analytics and insights (M = 3.24) are potential benefits of full AI implementation in academic libraries of state tertiary institutions in Enugu State, Nigeria. The highest-rated prospect was enhanced research support through intelligent search systems, while improved decision-making through data analytics and insights recorded the lowest mean score, although it remained above the decision benchmark. Generally, the cluster mean of 3.68, which falls within the real limit of 3.50–4.00, indicates that, in aggregate, the respondents strongly agreed that the listed items are potential benefits of AI implementation in academic libraries in Enugu State, Nigeria.

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Table 4: What are the enhancement strategies that can be adopted to facilitate the effective implementation of Artificial Intelligence in academic libraries in Enugu State, Nigeria?

S/N	Items	N	Mean	Std. Deviation	Dec.
1.	Adequate funding for AI infrastructure and technologies.	75	3.99	.115	Accepted
2.	Employing librarians with AI-related skills and competencies.	75	3.77	.481	Accepted
3.	Reliable internet connectivity and stable network infrastructure.	75	3.93	.251	Accepted
4.	Reliable and uninterrupted power supply.	75	3.99	.115	Accepted
5.	Positive acceptance and willingness to adopt technological change among library staff.	75	3.79	.412	Accepted
6.	Availability of AI implementation policies and regulatory frameworks	75	3.87	.414	Accepted
	Cluster Mean	**75**	**3.89**	**0.30**	**Accepted**

Table 4 presents the enhancement strategies that can be adopted to facilitate the effective implementation of Artificial Intelligence (AI) in academic libraries in Enugu State, Nigeria. The results show that all the six items had mean scores ranging from 3.77 to 3.99, which are above the decision benchmark of 2.50. This indicates that the respondents affirmed that adequate funding for AI infrastructure and technologies (M = 3.99), reliable and uninterrupted power supply (M = 3.99), reliable internet connectivity and stable network infrastructure (M = 3.93), availability of AI implementation policies and regulatory frameworks (M = 3.87), positive acceptance and willingness to adopt technological change among library staff (M = 3.79), and employing librarians with AI-related skills and

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competencies (M = 3.77) are strategies that can be adopted to facilitate the effective implementation of AI in academic libraries of state tertiary institutions in Enugu State, Nigeria. The highest-rated strategies were adequate funding for AI infrastructure and technologies and reliable and uninterrupted power supply, while employing librarians with AI-related skills and competencies recorded the lowest mean score, although it remained above the decision benchmark. Generally, the cluster mean of 3.89, which falls within the real limit of 3.50–4.00, indicates that, in aggregate, the respondents strongly agreed that the listed items are the enhancement strategies that can be adopted to facilitate the effective implementation of AI in academic libraries in Enugu State, Nigeria.

Recommendations

1. Government and institutional authorities should increase budgetary allocations to academic libraries to support AI infrastructure and systems acquisition.
2. Regular capacity-building programs and AI-focused training should be organized for librarians to develop technical competencies.
3. Develop and implement national and institutional AI policies and ethical frameworks to guide responsible AI use in libraries.
4. Strengthen ICT infrastructure in academic libraries, including stable electricity, internet access, and modern computer systems.

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5. Foster partnerships with tech firms, AI research institutions, and development agencies for knowledge exchange and resource mobilization.
6. Launch awareness campaigns to demystify AI and reduce resistance to change among library staff and users.

Conclusion

The integration of Artificial Intelligence in academic libraries of state tertiary institutions in Enugu State, Nigeria, presents both transformative opportunities and significant challenges. While AI offers the potential to revolutionize library services through automation, personalization, and enhanced research support, its implementation is hindered by infrastructural deficits, funding inadequacies, technical skill gaps, and ethical concerns. However, with strategic planning, investment, and stakeholder collaboration, these barriers can be overcome. Embracing AI is no longer a luxury but a necessity if academic libraries are to remain relevant in a fast-evolving digital information landscape. Proactive strategies must be adopted to ensure that libraries can transition smoothly into smart, AI-driven hubs of knowledge and innovation.

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