INFRASTRUCTURE READINESS FOR IMPLEMENTING ARTIFICIAL INTELLIGENCE AND INTEGRATED LIBRARY MANAGEMENT SYSTEMS IN ACADEMIC LIBRARIES IN NIGERIA: A SYSTEMATIC REVIEW

BY

Abubakar Hadiza Oluwatayo[1] M.A. Salubuyi[2] Isah Ndashiru[3]
Department of Library and Information Science, Federal University of Technology, Minna [1&2]
General Studies Department, Federal University of Technology, Minna[3]
Correspondence Email: hadizaolowodara@gmail.com

Abstract

The effective implementation of Artificial Intelligence (AI) and Integrated Library Management Systems (ILMS) has transformed library services globally, enhancing efficiency, accessibility, and user satisfaction. However, in developing countries such as Nigeria, infrastructural deficiencies pose significant barriers to adopting these technologies. This study systematically reviews existing literature on the infrastructural readiness of academic libraries in Nigeria to implement Artificial Intelligence (AI) and Integrated Library Management Systems (ILMS). Following Preferred Reporting Items for Systematic Reviews and Meta-Analyses *(PRISMA) guidelines, 11 relevant studies published between 2015–2025 were identified through searches of databases including Google Scholar, Scopus, and African Journals Online (AJOL). Findings reveal that Nigerian academic libraries face persistent infrastructural challenges, notably unreliable electricity, inadequate internet bandwidth, obsolete Information and Communication Technology equipment, and insufficient funding, which undermine their readiness for technological adoption. To address these challenges, the study recommends investments in reliable power supply, improved broadband internet access, modernization of ICT infrastructure, increased funding allocations, capacity-building programs for library staff, and the development of supportive policies and institutional roadmaps to guide technology adoption. While AI and ILMS have the potential to transform library services by enhancing efficiency, accessibility, and user satisfaction, the infrastructural deficiencies in Nigerian academic libraries remain a critical barrier. Addressing these gaps through strategic investments and coordinated interventions is essential to preparing Nigerian academic libraries to fully harness the benefits of AI and ILMS in the digital era.*

Keywords: Academic libraries; Artificial Intelligence (AI); Integrated Library Management Systems (ILMS); Nigeria, Systematic reviews.

Introduction

Academic libraries play a central role in higher education by supporting teaching, learning, and research. In today's digital era, Artificial Intelligence (AI) and Integrated Library Management Systems (ILMS) are transforming libraries through automation, personalisation, and improved access to information (Joshi, 2025). The emergence of these new technologies offers promising avenues for automating repetitive tasks, streamlining services, and improving user engagement. These technologies are being explored to make library services more accessible, responsive, and user-friendly.

In developed countries, AL and ILMS are been used in academic libraries to make the library perform more effectively and effectively. While developed countries have embraced these technologies, academic libraries in Nigeria face infrastructural constraints such as unstable electricity, poor internet services, and inadequate ICT facilities. This study examines the infrastructural readiness of Nigerian academic libraries for AI and ILMS adoption, focusing on electricity, internet connectivity, ICT hardware, funding, and staff capacity.

Statement of the Problem

Although AI and ILMS can enhance library operations by reduci ıg workload, improving information retrieval,

and supporting digital services, Nigerian academic libraries remain dependent on manual and semi-automated systems. Persistent challenges include slow information access, inadequate cataloguing systems, poor digital resource management, and limited staff skills. These gaps highlight the urgent need to evaluate the infrastructural readiness of Nigerian academic libraries for AI and ILMS adoption. As noted by Ajani et al. (2022), the successful adoption of AI in Nigerian libraries is often constrained by inadequate infrastructure, limited digital skills among library staff, and resistance to change, making it essential to assess both the opportunities and challenges of integrating such technologies. As such this study intends to show Infrastructure Readiness for Implementing Artificial Intelligence and Integrated Library Management Systems in Academic Libraries in Nigeria.

Objectives of the Study

The study aims to:

1. Examine the current state of infrastructure in Nigerian academic libraries.
2. Identify challenges hindering AI and ILMS adoption.
3. Recommend strategies to improve infrastructural readiness.

Research Questions

1. What is the current state of infrastructure in Nigerian academic libraries?
2. What challenges hinder infrastructural readiness for AI and ILMS?
3. What strategies can improve infrastructural readiness for AI and ILMS?

Literature Review

Studies on Nigerian academic libraries consistently report infrastructural challenges affecting technology adoption. Key issues include unreliable electricity (Ogbomo, 2019), poor internet connectivity (Chigbu and Dim, 2012), outdated ICT hardware (Nwachukwu et al., 2018), limited funding (Ishola, 2014), and inadequate staff training (Annune and Annune, 2023). Globally, AI and ILMS have been shown to improve cataloguing, user engagement, and data management (Lawless & Foster, 2020). However, Nigerian libraries lag behind due to weak policies and inconsistent government support (Ajani et al., 2022). The literature indicates that while awareness of AI and ILMS benefits exists, infrastructural readiness remains limited.

Current State of Infrastucture in Nigeria Academic Libraries

The review reveals that the availability and functionality of these infrastructures in Nigerian academic libraries remain poor:

Electricity Supply: Despite some institutions installing generators or solar panels, most libraries still suffer from long periods of power outages. In Nigeria, the persistent challenges of unstable power supply, frequent blackouts, and inadequate electricity infrastructure have continued to hamper the operations of universities (Olanrele, et al. 2020). The educational sector, especially university libraries, is significantly affected by this erratic power situation, resulting in interrupted access to digital resources, limited use of e-learning platforms, and poor ICT service delivery. Electricity challenges impede library automation, disrupt internet connectivity, and affect climate-controlled storage of sensitive materials such as archives and rare books. With the increasing reliance on digital tools for teaching, learning, and research, the absence of a stable power supply undermines the competitiveness and quality assurance capacity of Nigerian universities (Ebekozien, et al, 2022)

Internet Connectivity: Internet bandwidth in many universities remains limited and shared among multiple departments. This slows down access to web-based ILMS and AI tools. Studies noted that the average internet speed in Nigerian academic libraries was less than 2Mbp which is well below global benchmarks.

ICT Equipment: Outdated or insufficient hardware remains widespread. According to Nwachukwu et al. (2018), many institutions still use computers running unsupported operating systems (e.g., Windows 7 or XP), which limits compatibility with modern software.

Software Readiness: Some libraries use integrated systems like KOHA or Libsys, but the implementation is often partial. Features like circulation automation and user analytics are underutilized due to lack of staff capacity and funding

Data Security Infrastructure: Few libraries have invested in advanced data protection measures. (Echezona & Ugwu, 2010) stated that inadequate facilities and fund allocation to libraries are one of the major problems that militates against disaster management. The government pays little or no attention to disaster management finance to the public libraries as a whole. In 2003 a survey was launched world-wide among National Libraries in order to know which ones did have a disaster plan. The results were alarming. Out of 177 libraries, only 39 (22%) had a disaster plan (IFLA-PAC, 2006). These findings probably may be a general reflection of what is obtainable in most academic libraries in Nigeria today.

Theoretical Framework

This study adopts Technological Determinism Theory, which argues that technology shapes social

development and organisational change. Applied to academic libraries, the theory suggests that adopting AI and ILMS can transform library operations from manual to automated systems, provided the necessary infrastructure is in place.

Methodology

This study uses a systematic literature review method following a narrative synthesis approach guided by the PRISMA framework, to assess the infrastructural readiness of academic libraries in Nigeria for implementing Artificial Intelligence (AI) and integrated library Management System (ILMS). The methodology involves careful selection, screening, and analysis of relevant literature published between 2015 and 2025. Systematic literature reviews (SRs) are a method for synthesising scientific data to address a specific research question in a transparent and repeatable manner, while attempting to include all published data on the subject and evaluating the quality of this data (Lame, 2019).

Data Sources

The review draws on data from academic databases including Google Scholar, and African Journals Online (AJOL). These platforms provide access to peer-reviewed journal articles, conference papers, and empirical research within the specified time frame.

Search Strategy

A combination of keywords and Boolean operators were used during the search process, including:

"Artificial Intelligence in Nigerian Libraries"
"Integrated Library Management Systems in Nigeria"
"Library ICT infrastructure in Nigeria"
"Digital readiness of academic libraries"

Inclusion Criteria

Studies published between 2015 and 2025
Research focused on Nigerian academic libraries
Peer-reviewed empirical or systematic review papers
Articles addressing infrastructural or technological readiness

Exclusion Criteria

Non-academic libraries or international contexts outside Nigeria
Articles not available in full text
Opinion pieces or editorial content lacking empirical data

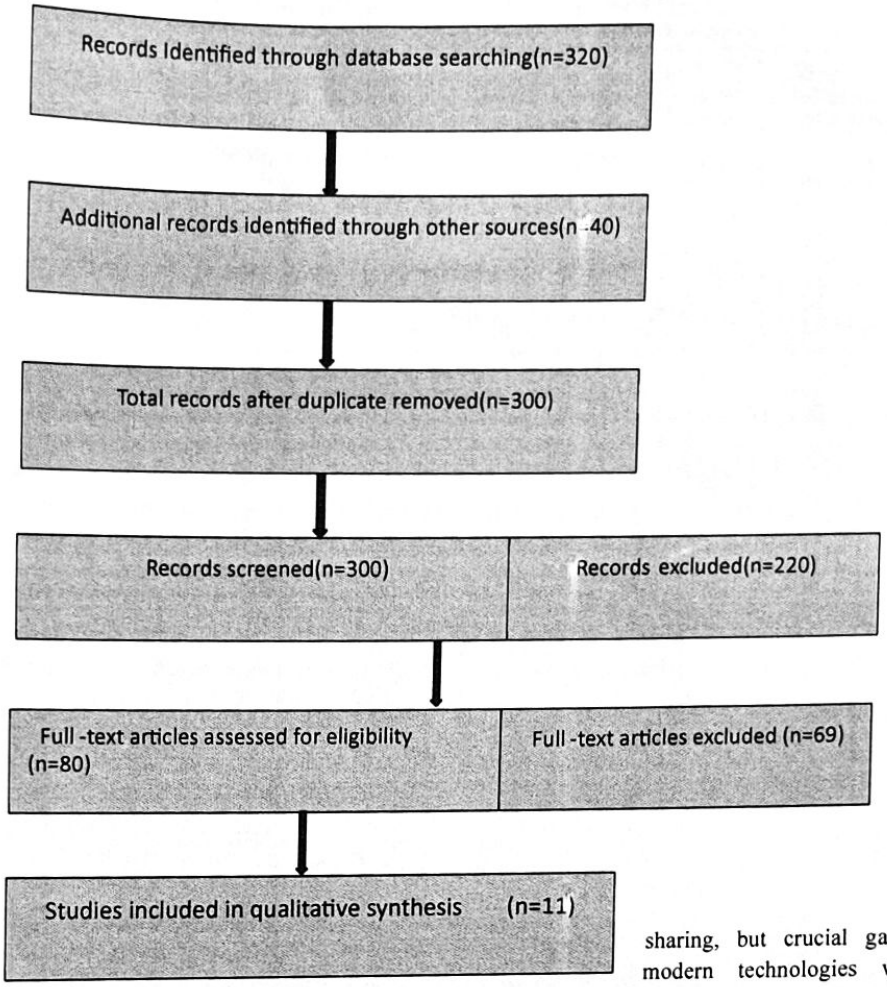

Figure 1: PRISMA Flow Diagram for the systematic review

Findings and Discussions

The findings are synthesised below across four themes: Availability of ICT Infrastructure; Power Supply & Connectivity; Digital Literacy & Technical Capacity; and Institutional

Availability of ICT Infrastructure

Many Nigerian academic libraries now have some ICT infrastructure, but it is often inadequate for demanding tasks such as AI adoption. In South-South universities, librarians were found to have basic access to digital applications, yet hardware and server systems were either obsolete or insufficient for advanced use (Okon et al., 2024). Studies indicated that many Nigerian libraries still operate on legacy systems with obsolete hardware and unsupported operating systems. (Ifijeh, 2020). Similarly, in Southeast Nigeria, a large majority of librarians reported that ICT tools supported resource sharing, but crucial gadgets and modern technologies were still lacking (Nwafor et al., 2023). These findings indicate that while a foundation exists, much of the infrastructure only supports basic automation rather than the sophisticated requirements of AI and modern ILMS

Power Supply and Connectivity

Unreliable electricity and unstable internet connectivity continue to undermine technological adoption in Nigerian academic libraries. Studies highlight that frequent power outages disrupt library services and damage equipment, while poor connectivity limits access to cloud-based systems (Iroaganachi et al., 2024). In a model for ICT-based resource sharing in Southeast Nigeria, poor electrification and inadequate internet access were ranked among the most serious challenges (Nwafor et al., 2023). Without stable power and reliable internet, attempts to implement AI and ILMS will remain unsustainable. Many libraries in Nigeria rely on public electricity supply, which is often

unstable and prone to outages. This instability hinders the consistent operation of AIdriven tools and ILMS platforms, which require uninterrupted power to function optimally (Bangani, 2024).

Multiple studies have documented the recurrent nature of power outages in Nigerian federal universities. (Aregbesola, et al. 2023), (Olatokun & Ayanbode ,2020) found that over 85% of university libraries in southern Nigeria experienced daily power outages, each lasting between 2 to 8 hours. Similarly, Ogbomo (2019) noted that many libraries operate without backup power, rendering digital systems non-functional during blackouts.

Digital and Technical Capacity

Even where infrastructure exists, many librarians lack the advanced skills needed to optimise it. A 2024 study in Kwara State found that while librarians demonstrated high levels of basic digital literacy, they were less confident with advanced competencies such as big data management or AI-driven tools (Fatile and Adebayo, 2024). Similarly, research on Nigerian university libraries and the Fourth Industrial Revolution observed that training programmes emphasise only basic ICT skills, leaving significant gaps in areas such as machine learning and data ethics (Owolabi, 2023).

Institutional Readiness and Policy Framework

Policy frameworks and institutional readiness remain uneven across Nigerian universities. Encouragingly, the Association of University Librarians of Nigerian Universities (AULNU) recently developed a roadmap for responsible AI adoption in academic libraries, signalling growing institutional awareness (Vanguard News, 2025). However, many institutions still lack robust digital strategies or data governance policies to support sustainable AI use (Ajani et al., 2022). A study of North-Central Nigerian universities also found that policies for electronic information resources were inconsistently applied, leading to fragmented implementation (Omotayo & Irechukwu, 2023).

Strategies for Improving Infrastructural Readiness

The literature recommends several strategies to address these challenges:

Government and Institutional Funding Initiatives: Increased funding from government agencies like TET Fund and private-public partnerships is necessary for infrastructural upgrades (Omotayo& Irechukwu, 2023).

Capacity Building and Training: Regular workshops, certifications, and ICT training for librarians are essential. Collaborative efforts between universities and international agencies can facilitate staff development (Annune & Annune, 2023).

Investing in Renewable Energy: To combat electricity issues, institutions should explore solar power or hybrid solutions. These provide sustainable alternatives to diesel generators

(Chukwusa, 2018)

Policy Development: Institutions should formulate clear digital transformation strategies, with specific guidelines for AI and ILMS implementation. These policies must address data privacy, system evaluation, and maintenance cycles.

Centralized IT Support: Establishing university-wide IT units to support library automation and AI integration can help streamline resource use and ensure professional system management.

Conclusion

Nigerian academic libraries remain underprepared for AI and ILMS adoption. Major gaps include unreliable electricity, inadequate internet, obsolete ICT equipment, poor funding, and limited technical expertise. Bridging these gaps is essential for libraries to provide competitive, technology-driven services.

Recommendations

1. Increase funding for ICT infrastructure through government, TETFund, and private partnerships.
2. Invest in renewable energy sources to ensure stable power supply for libraries.
3. Expand broadband internet connectivity across campuses.
4. Regularly upgrade ICT hardware and software to meet AI/ILMS requirements.
5. Establish continuous training programs on AI, ILMS, and data management for librarians.
6. Develop institutional and national digital strategies to guide AI adoption in libraries.

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