



AUTOMATION AND DIGITAL TRANSFORMATION IN NIGERIAN UNIVERSITY LIBRARIES: A THEMATIC ANALYSIS OF EMERGING TRENDS AND CHALLENGES

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Abstract

Purpose:

This study was carried out to review and synthesize existing research on the automation and digital transformation of Nigerian university libraries. It aimed to identify the major trends, challenges, and prospects associated with the adoption and integration of information and communication technologies (ICTs) for library service delivery in the 21st century.

Design/Methodology/Approach:

The study adopted a qualitative research design using a thematic content analysis approach. Empirical and theoretical studies published between 2000 and 2025 were systematically reviewed and analyzed. Data were drawn from peer-reviewed journals, conference papers, and institutional reports focusing on library automation and ICT integration in Nigerian academic libraries. The analysis was guided by the Technology Acceptance Model (TAM) and the Diffusion of Innovation (DOI) theory to interpret librarians' adoption behavior, institutional readiness, and innovation diffusion patterns.

Findings:

Findings revealed that while many Nigerian university libraries have adopted automation software such as CDS/ISIS, TINLIB, LIBPLUS, and KOHA, the level of implementation remains uneven. Challenges such as inadequate ICT infrastructure, unstable power supply, low technical skills among librarians, insufficient funding, and lack of policy coordination persist. Despite these limitations, automation has significantly improved cataloguing, circulation, and reference services, enhanced user satisfaction, and increased access to digital resources. Recent trends show growing adoption of open-source software and greater awareness of the need for digital transformation across university libraries.

Implications:

The study implies that sustainable automation in Nigerian university libraries requires policy consistency, strategic funding, human capacity development, and infrastructural upgrades. Institutional leadership and national regulatory bodies must collaborate to establish standard frameworks that promote interoperability, staff training, and technological innovation.

Originality/Value:

This paper contributes to the discourse on digital librarianship by presenting a consolidated thematic review of two decades of research on automation in Nigerian university libraries. It provides a holistic understanding of the technological, human, and institutional dynamics influencing automation and offers practical recommendations for sustainable digital transformation.

Keywords: Library automation; ICT integration; Academic libraries; Nigeria; Library software; Digital transformation; Technology Acceptance Model; Diffusion of Innovation.

Paper type: Review Article

Introduction

The integration of information and communication technologies (ICTs) has profoundly transformed library and

information services worldwide, reshaping how information is acquired, processed, and delivered. In the context of academic libraries, this transformation is most evident in the adoption of library automation, which refers to the use of computer-based systems to perform traditional library functions such as cataloguing, acquisition, circulation, serials management, and reference services (Rowley, 2018; Ifijeh, 2013). The evolution of library automation has redefined the philosophy and practice of librarianship, emphasizing efficiency, speed, accuracy, and remote accessibility in information service delivery.

In Nigeria, library automation began to gain prominence in the late 1990s with the introduction of systems such as CDS/ISIS, TINLIB, X-LIB, and later LIBPLUS, which were developed to address local library needs (Oketunji, 2000; Oludipe & Babafemi, 2019). Since then, universities and research institutions have made varying progress in automating their operations. The process has, however, been uneven due to financial, infrastructural, and technical challenges. Many libraries in the country still combine manual and automated systems, revealing a transitional phase between traditional and fully digital practices (Edoka, 2013; Nwalo & Ezeani, 2021).

Globally, automation is viewed not merely as a technological upgrade but as a strategic transformation that supports digital scholarship, open access, and knowledge dissemination (Kumar & Singh, 2020). Automated systems have become the backbone of resource organization, discovery, and user engagement, ensuring

that academic libraries remain relevant in an era dominated by digital platforms and online learning environments. For Nigerian academic libraries, embracing automation is essential for enhancing research visibility, integrating with institutional repositories, and supporting hybrid learning models that have become prominent after the COVID-19 pandemic (Okiki & Oyeniran, 2022).

Despite these advantages, several studies indicate that the level of automation in Nigerian university libraries remains moderate (Ifijeh, 2013; Oludipe & Babafemi, 2019; Oghenetega, 2023). Factors such as poor internet connectivity, unstable electricity supply, low ICT literacy among staff, and high software maintenance costs continue to impede full automation (Edewor, Emeka-Ukwu, & Eneh, 2020). Additionally, disparities between public and private universities have created an uneven landscape of technological adoption.

Library automation also aligns with the philosophy of modern librarianship, which emphasizes equitable access, lifelong learning, and preservation of knowledge through sustainable digital systems. Automation enables libraries to uphold these values by simplifying processes, improving retrieval efficiency, and providing seamless access to both print and electronic collections. In line with the global movement towards Library 4.0, automation is a prerequisite for intelligent library systems that incorporate artificial intelligence, big data analytics, and cloud-based services (Asemi & Ahmadi, 2021).

Given the growing importance of ICTs in scholarly communication, a comprehensive review of library automation within Nigerian academic libraries is imperative. Such a review not only consolidates existing research but also highlights prevailing

challenges, opportunities, and directions for policy and practice. This study therefore synthesizes existing literature on library automation and ICT integration in Nigerian academic libraries, identifying trends, gaps, and prospects for sustainable digital transformation.

The evolution of library automation in Nigeria is closely tied to the global advancement of information and communication technologies (ICTs) and the increasing demand for efficient information management systems. Library automation, in its simplest form, refers to the application of computer technology to perform library operations and services that were previously executed manually (Rowley, 2018). The concept originated in the 1930s with the advent of mechanized data processing and became more pronounced in libraries during the 1960s and 1970s when mainframe computers were introduced for cataloguing and circulation purposes (Asemi & Ahmadi, 2021).

In Nigeria, automation in libraries began to take root in the late 1980s and early 1990s, coinciding with the expansion of higher education and the gradual digitalization of administrative systems. The National Universities Commission (NUC) and the World Bank played significant roles in promoting automation through the World Bank/National Universities Development Programme (NUDP), which provided funding and technical support for computerization projects in selected university libraries (Oketunji, 2000). Early initiatives included the adoption of the UNESCO-developed software CDS/ISIS (Computerized Documentation Service/Integrated Set of Information System), which was designed for bibliographic database management. This system became the first widely used

automation software among Nigerian academic libraries due to its adaptability and affordability (Oludipe & Babafemi, 2019).

Following CDS/ISIS, other software such as TINLIB (The Information Navigator Library Management System), X-LIB, GLAS, and LIBPLUS were introduced to provide more comprehensive automation of cataloguing, acquisition, and circulation operations (Adogbeji & Onobwakpor, 2004). These systems enabled libraries to digitize catalogues, manage lending activities, and produce bibliographic records more efficiently. However, their deployment was limited by infrastructural deficiencies, high licensing costs, and inadequate technical expertise among library staff (Ifijeh, 2013; Edeka, 2013).

During the early 2000s, the Federal Government of Nigeria launched the National Information Technology Policy (2001), which aimed to integrate ICT into education, governance, and research. This policy catalyzed renewed efforts by university libraries to automate their operations. Institutions such as the University of Ilorin, Covenant University, and the University of Ibadan made significant strides in computerizing their catalogues, introducing Online Public Access Catalogues (OPAC), and connecting library resources to digital repositories (Odu, 2010; Edewor et al., 2020). The establishment of the Nigerian Universities Commission's Virtual Library Project (2003) also marked a major milestone by facilitating centralized access to e-journals, theses, and databases across universities.

Despite these initiatives, the extent of automation varies widely among institutions. Private universities such as Covenant University and Babcock University are often more advanced in automating their library

systems compared to their public counterparts, largely due to better funding, institutional commitment, and ICT infrastructure (Ifijeh, 2013). In contrast, many public universities continue to face serious barriers such as obsolete hardware, unstable electricity, low bandwidth, and inadequate ICT training for librarians (Edewor et al., 2020; Oghenetega, 2023).

Globally, the concept of library automation has evolved into broader paradigms such as digital libraries, virtual libraries, and Library 4.0, which emphasize interoperability, user-centered services, and artificial intelligence (Asemi & Ahmadi, 2021; Kumar & Singh, 2020). Nigerian libraries are gradually aligning with these trends through the adoption of integrated library management systems (ILMS), digital repositories, and open-source software such as KOHA and DSpace. Nonetheless, progress remains incremental and uneven, reflecting broader socio-economic and infrastructural challenges within the country's higher education system.

Thus, the background of library automation in Nigeria reveals a dual narrative of innovation and struggle. On one hand, the drive towards automation has demonstrated the resilience and adaptability of library professionals in embracing technological change. On the other hand, persistent limitations ranging from inadequate funding and erratic power supply to limited digital competencies have slowed the pace of full automation. The continued dependence on donor funding and external expertise underscores the need for sustainable national strategies that will support locally driven innovations in library automation and ICT integration.

The twenty-first century has witnessed a radical transformation in the philosophy and

practice of librarianship. Libraries are increasingly recognized as dynamic knowledge ecosystems rather than static repositories, driven by rapid advances in information and communication technologies (ICTs). In this context, library automation has become indispensable for ensuring efficient service delivery, effective resource management, and enhanced user satisfaction. Globally, automation has streamlined cataloguing, circulation, and reference operations while facilitating remote access to digital collections (Kumar & Singh, 2020; Asemi & Ahmadi, 2021).

However, in Nigeria, the transition from traditional to automated library systems has been slow, uneven, and fraught with persistent challenges. Although many academic libraries have initiated automation projects, the extent of implementation remains partial, often limited to isolated functions such as cataloguing or circulation (Ifijeh, 2013; Oludipe & Babafemi, 2019). Comprehensive integration where all library services are fully computerized and interoperable remains largely unrealized. This has created a dual operational culture in which librarians rely simultaneously on manual and digital systems, resulting in inefficiency, duplication of efforts, and poor user experiences (Edewor, Emeka-Ukwu, & Eneh, 2020).

Furthermore, automation initiatives in Nigerian university libraries have suffered from inadequate infrastructural support. Unstable power supply, poor internet connectivity, and low bandwidth have hindered the consistent use of automated systems (Oghenetega, 2023). In addition, financial constraints and the high cost of proprietary software licenses limit the ability of libraries to sustain automation projects. The problem is compounded by limited ICT competence among library personnel, many

of whom have received minimal formal training in emerging technologies and integrated library management systems (Edoka, 2013; Nwalo & Ezeani, 2021).

From a theoretical perspective, the slow adoption of automation reflects deeper institutional and behavioral challenges. The Technology Acceptance Model (TAM) and Diffusion of Innovation (DOI) theory suggest that successful technology integration depends not only on the availability of infrastructure but also on the perceived usefulness and ease of use by librarians, as well as institutional readiness to support innovation (Davis, 1989; Rogers, 2003). Many Nigerian libraries lack structured change management frameworks that foster acceptance, experimentation, and continuous professional development.

Empirical evidence also reveals inconsistencies in reported progress. While some studies (e.g., Oludipe & Babafemi, 2019) describe a “high level of automation,” others (Ifijeh, 2013; Edewor et al., 2020) classify it as moderate or emerging. This divergence underscores the absence of a comprehensive, up-to-date synthesis of automation practices across Nigerian academic libraries. Moreover, most existing studies focus narrowly on technical or operational aspects, with limited examination of the philosophical, human, and policy dimensions of automation.

Consequently, there remains a significant research and practice gap in understanding how library automation can be sustainably implemented within Nigeria’s higher education context. There is also a lack of integrated analysis that connects automation to broader themes of digital transformation, service innovation, and scholarly communication. This study, therefore, seeks to fill this gap by synthesizing existing

literature to provide a holistic view of library automation and ICT integration in Nigerian academic libraries highlighting trends, challenges, and prospects, and offering recommendations for sustainable digital transformation.

Objectives of the Study

To achieve this aim, the study is guided by the following specific objectives:

1. To examine the trends in the adoption and implementation of library automation and ICT tools in Nigerian academic libraries.
2. To identify and analyze the challenges hindering full-scale automation in Nigerian university libraries, including infrastructural, financial, human, and policy-related constraints.
3. To evaluate the impact of automation on the quality, efficiency, and accessibility of library services, with emphasis on user satisfaction and staff performance.
4. To explore the prospects and strategies for achieving sustainable automation and digital transformation in Nigerian academic libraries.

Theoretical Framework

The theoretical foundation of this study is built upon two complementary models that explain technology adoption and innovation diffusion in organizational settings: The Technology Acceptance Model (TAM) by Davis (1989) and the Diffusion of Innovation (DOI) theory by Rogers (2003). These theories provide valuable insights into the behavioral, institutional, and contextual factors that influence the adoption of

automation technologies in academic libraries.

Technology Acceptance Model (TAM)

The Technology Acceptance Model, developed by Davis (1989), is one of the most widely applied frameworks for understanding user acceptance of technology. The model postulates that two core beliefs — Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) — determine users' attitudes toward technology and their eventual intention to use it. In the context of library automation, Perceived Usefulness refers to librarians' belief that automation systems enhance their job performance, streamline library operations, and improve service delivery. Perceived Ease of Use, on the other hand, captures how effortless librarians perceive the use of automation software and ICT tools to be in performing library functions such as cataloguing, circulation, and reference services (Nwalo & Ezeani, 2021; Edewor, Emeka-Ukwu, & Eneh, 2020).

The TAM underscores the importance of user attitudes and skills in the success of automation projects. Even when infrastructure and software are available, librarians' reluctance to engage with new systems due to low ICT literacy or perceived complexity can hinder adoption (Asemi & Ahmadi, 2021). Therefore, the model highlights that technological readiness must be complemented by human readiness, including training, motivation, and positive perception toward innovation. Several Nigerian studies have implicitly validated TAM's propositions. For instance, Ifijeh (2013) and Oludipe and Babafemi (2019) found that librarians with higher ICT competence were more likely to utilize automated systems effectively, while low technical proficiency correlated with partial

or failed automation. Consequently, interventions aimed at automation must not only provide hardware and software but also address user perception and capacity building.

Diffusion of Innovation (DOI) Theory

The Diffusion of Innovation (DOI) theory, propounded by Rogers (2003), explains how new ideas and technologies spread within a social system over time. The theory identifies five stages in the innovation-decision process: knowledge, persuasion, decision, implementation, and confirmation. It also classifies adopters into categories innovators, early adopters, early majority, late majority, and laggards based on their willingness to embrace new technologies.

In relation to library automation, the DOI theory provides a lens for understanding the varying pace of adoption among Nigerian academic libraries. Some institutions, particularly private universities such as Covenant and Babcock, can be described as innovators or early adopters due to their proactive investment in ICT infrastructure and automation software (Ifijeh, 2013). In contrast, many public universities fall within the late majority or laggard categories, hindered by bureaucratic structures, limited funding, and infrastructural inadequacies (Edewor et al., 2020; Oghenetega, 2023).

Rogers (2003) identified five attributes that influence the rate of innovation diffusion: relative advantage, compatibility, complexity, trialability, and observability. Applying these to library automation:

1. Relative advantage reflects the perceived benefits of automation over manual systems.
2. Compatibility refers to the extent to which automation aligns with existing

library workflows and institutional culture.

3. Complexity addresses how difficult the technology is to understand and use.
4. Trialability captures opportunities for pilot testing and gradual adoption.
5. Observability concerns the visibility of successful automation outcomes in peer institutions.

Nigerian libraries often struggle with complexity and compatibility due to lack of technical training and the mismatch between imported software and local needs (Oketunji, 2000). The absence of trial phases and demonstrable models' further limits observability, slowing diffusion across the academic sector.

Integrative Application of TAM and DOI

Together, TAM and DOI provide a comprehensive theoretical foundation for understanding both individual and institutional dimensions of library automation. TAM emphasizes the micro-level factors such as perceptions, attitudes, and skills that shape librarians' willingness to use technology, while DOI focuses on macro-level factors, such as organizational readiness, policy support, and the social diffusion of innovation. This integrative theoretical framework guides the present review by situating library automation not merely as a technical initiative but as a complex social and organizational process. It underscores that sustainable automation in Nigerian academic libraries depends on institutional leadership, adequate infrastructure, positive user perception, and continuous professional development.

Review of Related Literature

Conceptual Review

The Concept of Library Automation

Library automation refers to the use of computers and communication technologies to perform traditional library operations and services that were once carried out manually (Rowley, 2018). These include cataloguing, acquisitions, circulation, serials control, and reference services. Automation is a subset of library informatization the broader integration of ICT into library management and service delivery (Kumar & Singh, 2020). It involves not only hardware and software but also the systematic re-engineering of workflows to improve efficiency, accuracy, and accessibility. Historically, automation emerged in Western libraries during the 1960s when mainframe computers were introduced to process bibliographic records and manage circulation. With the advent of microcomputers in the 1980s and networked systems in the 1990s, automation expanded to encompass online catalogues, digital repositories, and integrated library management systems (Asemi & Ahmadi, 2021). In developing nations like Nigeria, the process began later, shaped by infrastructural limitations and the need for cost-effective local solutions.

Automation fundamentally redefines the philosophy of librarianship. Traditional library practice emphasized custodianship, preservation, and manual organization of print materials. Automation shifts this paradigm toward user-centeredness, accessibility, and digital transformation, thereby aligning libraries with global trends in knowledge management and open scholarship (Ifijeh, 2013; Oghenetega, 2023). Through automation, libraries can integrate digital collections, support hybrid learning, and enhance their visibility in the global information network.

Rationale and Benefits of Library Automation

Automation enables libraries to achieve efficiency, accuracy, and speed in information processing and retrieval. Studies have shown that automated systems reduce duplication of effort, minimize human error, and improve service responsiveness (Oludipe & Babafemi, 2019; Edewor, Emeka-Ukwu, & Eneh, 2020). Automated cataloguing, for instance, facilitates the creation of standardized bibliographic records using formats such as MARC and Dublin Core, while circulation systems enhance inventory control and resource tracking. Moreover, automation enhances user satisfaction by providing Online Public Access Catalogues (OPACs), self-checkout systems, and remote access to resources (Asemi & Ahmadi, 2021). It also supports administrative efficiency by enabling data analytics for decision-making and performance monitoring. In the digital age, library automation is not merely a technical upgrade but a strategic response to evolving user expectations, the proliferation of digital resources, and the global movement toward open access and institutional repositories.

Automation Software and Systems

Over the years, several software applications have been developed to automate library functions. Globally, systems such as INNOPAC, Aleph, KOHA, and Virtua are widely used (Kumar & Singh, 2020). In Nigeria, the automation journey began with CDS/ISIS, a UNESCO-sponsored database management software designed for developing countries. This was followed by TINLIB, a DOS-based integrated library management system popular in the 1990s (Oketunji, 2000). Later, indigenous and open-source systems like X-LIB, LIBPLUS, and KOHA emerged to address local needs

and cost challenges. Open-source solutions such as KOHA and Evergreen have gained significant traction due to their affordability, flexibility, and community-based support (Edewor et al., 2020). These systems align with the principles of sustainability and localization key concerns in African library automation. Nonetheless, challenges persist regarding customization, maintenance, and technical expertise.

Theoretical Review

Technology Acceptance Model (TAM)

As earlier discussed, the Technology Acceptance Model (TAM) (Davis, 1989) explains users' adoption behavior based on perceived usefulness and ease of use. In library contexts, TAM provides a framework for understanding how librarians perceive and interact with automation systems. Studies (Ifijeh, 2013; Nwalo & Ezeani, 2021) have found that librarians who consider automation tools beneficial to their professional duties are more inclined to use them effectively. Conversely, negative attitudes and technophobia hinder utilization, even where systems are available. TAM also highlights the importance of training, motivation, and change management in influencing adoption. Nigerian university libraries that have conducted continuous ICT training for staff report higher automation success rates (Edewor et al., 2020). Thus, enhancing the perceived ease of use through practical orientation and ongoing support can foster sustainable technology acceptance.

Diffusion of Innovation (DOI) Theory

Rogers' (2003) Diffusion of Innovation (DOI) theory complements TAM by emphasizing the process through which innovations spread within social systems. It categorizes adopters as innovators, early adopters, early majority, late majority, and

laggards, depending on their readiness to embrace change. In Nigerian academic libraries, diffusion is influenced by institutional culture, leadership commitment, and resource availability. Private universities such as Covenant and Babcock are often innovators, while many public universities fall within the late majority category due to bureaucratic and infrastructural barriers (Ifijeh, 2013; Oghenetega, 2023).

Empirical Review

Trends in Library Automation in Nigeria

Empirical studies indicate that Nigerian academic libraries have made gradual progress in automating their operations since the 1990s. Oketunji (2000) and Adogbeji and Onobwakpor (2004) identified early automation efforts centered on CDS/ISIS and TINLIB systems. However, adoption was limited to a few libraries due to cost and technical challenges. By the 2010s, several universities began adopting web-based and open-source systems such as KOHA, X-LIB, and LIBPLUS (Oludipe & Babafemi, 2019). Ifijeh (2013) reported that automation had improved cataloguing efficiency and reference services in university libraries, though implementation remained partial. Edewor et al. (2020) observed a similar pattern, describing the level of automation as “moderate,” with most libraries automating only cataloguing and circulation. More recent studies (Oghenetega, 2023; Nwalo & Ezeani, 2021) highlight a post-COVID acceleration in automation efforts, especially through virtual reference services, institutional repositories, and digital access to theses and dissertations.

Challenges of Library Automation

The challenges confronting library automation in Nigeria are multifaceted. Infrastructural deficiencies notably unstable

power supply, poor internet connectivity, and outdated hardware remain the most persistent (Edewor et al., 2020). Financial constraints have also limited the procurement of up-to-date software and hardware. Many libraries depend on project-based funding rather than sustainable institutional budgets (Ifijeh, 2013). Human resource challenges are equally significant. Limited ICT competence among librarians hinders effective system utilization. Continuous professional development is often neglected due to inadequate training budgets (Edoka, 2013). Additionally, software maintenance and vendor dependency pose operational problems, as many systems require external expertise for upgrades or troubleshooting (Oludipe & Babafemi, 2019). Policy-related issues compound the situation. The absence of national automation standards, interoperability frameworks, and institutional ICT policies has led to fragmentation and duplication of efforts. The lack of collaboration among university libraries also restricts shared learning and resource pooling (Nwalo & Ezeani, 2021).

Impact of Automation on Library Services

Despite challenges, automation has had a positive impact on library service delivery. Studies have documented improved cataloguing accuracy, faster retrieval, enhanced circulation efficiency, and increased user satisfaction (Ifijeh, 2013; Oludipe & Babafemi, 2019). Automation has also enhanced the visibility of academic outputs through institutional repositories and e-resources platforms (Oghenetega, 2023). Furthermore, automation promotes data-driven decision-making, enabling libraries to analyze usage patterns and allocate resources efficiently. Automated systems facilitate integration with learning management systems (LMS) and digital scholarship platforms, aligning libraries with the broader

mission of universities to support teaching, learning, and research in a digital environment.

Prospects for Sustainable Automation

The future of library automation in Nigeria lies in sustainability and innovation. The adoption of open-source software such as KOHA, Evergreen, and DSpace offers cost-effective and customizable alternatives to proprietary systems (Edewor et al., 2020). The growth of cloud computing and Library 4.0 technologies including artificial intelligence, Internet of Things (IoT), and big data analytics presents new opportunities for enhancing library efficiency (Asemi & Ahmadi, 2021). There is also growing advocacy for collaborative automation through consortia and networked systems. For instance, regional initiatives under the National Universities Commission (NUC) Virtual Library Project and the Librarians' Registration Council of Nigeria (LRCN) digital agenda can promote resource sharing and standardization. Most importantly, capacity building remains central to sustainable automation. Regular training in ICT literacy, database management, and emerging technologies will empower librarians to operate and maintain automated systems effectively. Strategic government support, institutional funding, and research collaboration are critical to achieving full automation across Nigerian academic libraries.

Methodology

This study adopted a qualitative research design, specifically a thematic content analysis approach, to review and synthesize existing literature on library automation and ICT integration in Nigerian academic libraries. The goal was to consolidate diverse empirical and theoretical insights into a

coherent understanding of the trends, challenges, and prospects shaping the automation landscape.

Research Design

The research is a systematic literature review guided by qualitative synthesis principles. This design is appropriate for integrating results from multiple independent studies to generate cumulative knowledge and identify thematic patterns (Booth, Papaioannou, & Sutton, 2016). The study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure rigor, transparency, and replicability in the review process.

Data Sources

Relevant studies were sourced from multiple databases and repositories, including Google Scholar, ResearchGate, EBSCOhost, Scopus, and the Library Philosophy and Practice (LPP) archive. In addition, institutional publications and reports from the National Universities Commission (NUC) and the Librarians' Registration Council of Nigeria (LRCN) were reviewed to capture national perspectives on ICT policy and library automation. The uploaded compilation of automation-related papers served as the core data corpus for this synthesis, supplemented with recent peer-reviewed articles published between 2000 and 2025. The inclusion of a 25-year span allowed for longitudinal insights into the evolution of library automation in Nigeria.

Inclusion and Exclusion Criteria

The following criteria guided the selection of studies:

Inclusion Criteria:

1. Empirical and theoretical studies focusing on library automation or ICT integration in Nigerian academic libraries.
2. Articles published in peer-reviewed journals, conference proceedings, theses, or institutional reports.
3. Studies written in English and published between 2000 and 2025.
4. Works providing substantive data or analysis related to trends, challenges, software systems, user adoption, or prospects.

Exclusion Criteria:

1. Studies focusing solely on ICT use in public or school libraries (unless they provided comparative insights).
2. Non-scholarly materials such as blog posts, news articles, or promotional content.
3. Studies outside the specified date range or geographical context.

Data Extraction and Analysis

Data were extracted systematically by reading and coding the selected documents. Key variables such as publication year, study setting, automation software, level of implementation, identified challenges, and recommendations were recorded. Using thematic content analysis, the extracted data were coded inductively to identify recurring patterns and concepts (Braun & Clarke, 2006). These codes were subsequently organized into major themes:

1. Trends in Library Automation
2. ICT Infrastructure and Software Systems
3. Challenges of Automation
4. Impact on Service Delivery and User Satisfaction
5. Prospects for Sustainable Automation

Each theme was analyzed in light of the Technology Acceptance Model (TAM) and the Diffusion of Innovation (DOI) theory to interpret behavioral and institutional dynamics affecting automation in Nigerian academic libraries.

Validation and Reliability

To ensure reliability, cross-validation was carried out by comparing interpretations across multiple sources addressing similar topics. The study also adhered to the principle of **triangulation**, integrating findings from both qualitative (descriptive) and quantitative (survey-based) studies to provide a balanced synthesis (Creswell, 2014).

Ethical Considerations

This study relied exclusively on secondary data derived from published sources, and no direct interaction with human participants occurred. Consequently, ethical concerns such as informed consent or confidentiality did not apply. However, due diligence was exercised to properly acknowledge all authors through accurate citation and referencing following APA 6th edition standards.

Conclusion

The integration of information and communication technologies (ICTs) through library automation has become a defining characteristic of modern academic librarianship. From the synthesis of the reviewed literature, it is evident that automation has significantly reshaped the operations, services, and professional practices of Nigerian academic libraries. The gradual shift from manual to computerized systems has improved cataloguing accuracy, enhanced circulation efficiency, and

facilitated user access through online catalogues and digital repositories. However, despite more than two decades of progress, library automation in Nigeria remains partial and uneven. The findings reveal a consistent pattern of infrastructural inadequacy, limited ICT skills among library personnel, erratic funding, and weak institutional policies. While some universities particularly private institutions have achieved advanced automation, many public universities continue to rely on hybrid systems, reflecting systemic disparities in funding and management support.

The study also affirms that automation is not merely a technological innovation but a philosophical and organizational transformation in library practice. It redefines librarianship from a custodial to a service-oriented discipline centered on user needs, accessibility, and continuous innovation. When effectively implemented, automation aligns libraries with global movements in open access, digital scholarship, and the knowledge economy. The application of the Technology Acceptance Model (TAM) and Diffusion of Innovation (DOI) theory underscores that sustainable automation requires both technological and human readiness. Librarians' perceptions of usefulness and ease of use (as proposed by TAM) must align with institutional structures and cultures that facilitate innovation diffusion (as emphasized by DOI). Thus, successful automation depends not only on infrastructure and software but also on leadership, training, policy consistency, and collective vision.

In conclusion, Nigerian academic libraries stand at a crossroads between technological potential and persistent structural barriers. To fully realize the benefits of automation, libraries must move beyond isolated initiatives toward an integrated, sustainable

digital transformation strategy grounded in collaboration, innovation, and professional development.

Recommendations

Based on the findings and discussions, the following recommendations are proposed to strengthen and sustain library automation in Nigerian academic libraries:

1. Federal and state governments should prioritize investment in ICT infrastructure within university systems, ensuring stable electricity, broadband internet, and modern computer facilities. Institutions should explore solar-powered alternatives to mitigate power challenges that frequently disrupt automation systems.
2. Academic libraries should adopt open-source systems such as KOHA, Evergreen, and DSpace, which offer flexibility, cost efficiency, and community-driven support. Consortia-based software customization and shared maintenance models can enhance sustainability.
3. University management and funding bodies (e.g., TETFUND, NUC) should establish dedicated budget lines for library automation and digital resources. Institutional leadership should demonstrate strategic commitment through policy inclusion, periodic evaluation, and performance benchmarks.
4. Continuous ICT training and re-skilling of librarians should be institutionalized through workshops, certifications, and collaborations with ICT departments. Library schools in Nigeria should integrate automation and digital librarianship into their curricula to prepare graduates for emerging digital environments.

5. The Librarians' Registration Council of Nigeria (LRCN) and the National Universities Commission (NUC) should jointly develop national standards for library automation, covering interoperability, metadata standards, and best practices. Policies should encourage collaborative automation networks among libraries to promote resource sharing and avoid duplication of effort.
6. Librarians and library schools should engage in applied research on software localization, artificial intelligence in library systems, and the development of indigenous automation tools. Government and donor agencies should fund innovation grants targeted at library technology development.
7. Regional and institutional consortia can promote shared licensing, training, and technical support. Collaborative platforms such as the NUC Virtual Library should be revitalized to enable collective resource management and interoperability. Libraries should adopt participatory approaches by involving users in system design and feedback processes. This enhances usability, relevance, and long-term user satisfaction.
8. Periodic assessment of user experiences should inform automation upgrades and digital service innovation.

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