

Management of Academic Library Services in Digital Age: Prospect, Challenges and Solution

Gbemisola O. AKOMOLAFE¹, Japheth A. YAYA² (✉), Oluwole A. ODUNOLA³, Adetayo T. AKOMOLAFE⁴, Ismail A. MOMOH⁵ & Ajeigbe E. AFOLAMI⁶

^{1,2,3,5,6}Department of Library and Information Science, Federal University Oye-Ekiti; Oye Ekiti

⁴Department of Forensic Science, Federal University Oye-Ekiti; Oye Ekiti

Abstract

The study examined the management of academic library services in Nigeria within the context of digital transformation, and explored the prospects, challenges, and practical solutions shaping the transition toward digital maturity. Guided by the Diffusion of Innovations Theory, the study adopted a combined conceptual and empirical approach, utilizing qualitative content analysis and synthesis of secondary data derived from recent peer-reviewed journals. Data extracted from documented findings were presented in structured tables to address four core research objectives. The findings revealed that academic libraries have experienced significant gains including enhanced resource accessibility, improved preservation methods, operational efficiency, and increased user satisfaction. However, persistent challenges such as poor ICT infrastructure, limited staff training, inadequate funding, and low cybersecurity preparedness continue to impede progress. The study also identified emerging best practices in capacity building, collaborative consortia, policy implementation, and sustainability planning. A contextually relevant strategic framework was developed, proposing leadership, investment, and professional development as key enablers of digital transformation. The study concluded that comprehensive, policy-driven, and professionally equipped library system are essential for sustaining digital maturity in academic libraries.

Keywords

Innovation, policy formulation, mentorship, governance, preservation

Corresponding Author (✉)

japheth.yaya@fuoye.edu.ng
Department of Library and Information
Science, Federal University Oye-Ekiti;
Oye Ekiti

© Nigeria Library Association Enugu
State Chapter

Introduction

Academic libraries have always been serving as the backbone of higher education, functioning as centers for knowledge acquisition, innovation, and scholarship. Traditionally, these libraries focused on acquiring and managing printed collections, supporting curriculum and research needs, and providing quiet study spaces. However, with the rapid advent of the digital era, marked by the rise of online databases, e-books, open access resources, and digital pedagogies, academic libraries have been compelled to redefine their roles and operations. This is leading to transformation of the libraries. This ongoing transformation,

often referred to as “digital transformation,” involves the integration of digital technologies into every facet of library services and operations (Odunlade & Ojo, 2023).

Digital libraries are not merely online repositories of digitized content; they embody a larger ecosystem comprising staff [specially trained staff], digital infrastructure, and purposeful services aimed at preserving, organizing, and making digital knowledge accessible to a defined academic community. This expanded conception encompasses not only digitized archival materials but also born digital content, such as institutional repositories, research data sets, and virtual reference systems that underpin modern scholarly activities.

In higher education landscape, the importance of digital transformation in academic libraries cannot be overstated. E-resource platforms have democratized access to knowledge, enabling students and faculty to consult peer-reviewed journals, datasets, and multimedia materials from remote locations at any time of day. (Joyce & Paul, 2024). This “anytime anywhere” access has become particularly vital during disruptions such as the COVID-19 pandemic, when learning and research were forced to escape traditional campus confines.

Beyond digital collections, academic libraries are increasingly evolving into interactive learning hubs, often referred to as “learning commons” or “information commons.” These multifunctional spaces integrate technology, collaboration zones, and digital literacy support, reflecting the contemporary user demand for dynamic, technology rich environments (Gurdish, 2018). Barclay (2017) noted that although print circulation has declined, visits to these remained academic libraries have steadily increased signaling their enduring relevance as physical and digital learning environments.

Therefore, given this multifaceted transformation, the effective management of academic library services in the digital age has emerged as both a priority and a challenge. Library administrators must now navigate issues related to infrastructure modernization, digital preservation, open access policies, accessibility, digital literacy training, and the integration of emerging technologies such as Artificial Intelligence (AI), Internet of Things (IoT), and data analytics (Saib et al., 2023). Success in this context hinges on cultivating digital maturity, a concept referring to an institution’s capacity to leverage technology for enhanced productivity, service quality, and mission fulfillment, while harmonizing people, processes, and digital systems (Adeleke et al., 2022).

The significance of this digital transformation is manifold. First, it ensures equitable access to scholarly information for a wider user base, including distance learners, part-time researchers, and users with accessibility requirements. Second, it enriches academic libraries’ pedagogical contributions, positioning librarians as educators and digital literacy mentors within the digital learning ecosystem (Saib et al., 2023). Third, it supports institutional goals in research, innovation, and global competitiveness, as universities increasingly rely on digital scholarship and open science practices. The digital maturity of academic libraries is now integral to institutional accreditation and quality assurance frameworks, as seen in Nigerian universities where accreditation standards allocate over 70% weight to library facilities, including digital services.

Despite these compelling prospects, managing digital transformation presents multiple challenges. Many academic libraries in regions such as Sub-Saharan Africa face constraints including inadequate funding, unreliable internet and power supplies, limited ICT infrastructure, and a deficit in staff digital competencies. Professional development opportunities for librarians are often sporadic, and institutional policies may not prioritize digital investment, thus impeding sustainable progress (Odunlade & Ojo, 2023). Moreover, digital inclusion remains an issue: not all students possess sufficient technology or skills to access e-resources effectively, thereby exacerbating educational inequities.

Therefore, addressing these complex dynamics, focused research is needed to explore three interrelated dimensions: the prospects offered by digital technologies; the practical challenges that hinder effective implementation; and the strategic solutions necessary to guide successful transformation. These dimensions form the basis of the study’s research aim: to develop a comprehensive model of digital-age academic

library service management rooted in the lived experiences of Nigerian academic librarians and managers.

The main objective of the study is to examine the management of academic library services in Nigeria, while the specific objectives of the study were to:

- vi. examine the perceived benefits and opportunities afforded by digital transformation in academic library services in Nigeria;
- vii. identify and analyse the operational, technological, and organizational challenges affecting digital transition in Nigeria;
- viii. identify best-practice frameworks, including policy, capacity building, and collaboration models, that facilitate effective digital library service management in Nigeria; and
- ix. propose a contextually relevant strategy for academic libraries transitioning to digital maturity, articulating leadership imperatives, investment priorities, and professional competencies.

This study addresses an urgent knowledge gap. While global literature documents broad trends in academic library digitalization, limited scholarly attention has focused on the managerial dimensions in low-resource environments. Nigeria, as Africa's leading higher education hub, offers valuable insights into how systemic issues, such as institutional governance, funding ecology, and skills infrastructure, influence digital library outcomes. By leveraging qualitative insights from practitioners in the field, this research aims to generate pragmatic recommendations that can guide policymakers, university leadership, library administrators, and development partners in operationalizing digital libraries effectively.

The study structure proceeds as follows: first, it explores the conceptual and theoretical

frameworks underpinning digital transformation and socio-technical systems (Literature Review/Conceptual Framework). It then explicates the qualitative methodology used to gather and analyse data from library professionals. Following that, the findings and discussion section organizes insights around prospects, challenges, and solutions. The paper concludes with a synthesis of key findings, practical recommendations, and suggestions for future research.

Literature Review

The foundation of any rigorous study on the management of academic library services in the digital age begins with a clear conceptual understanding of the core variables. Digital infrastructure encompasses all hardware and software tools including kiosks QR code systems online public access catalogs mobile applications and cloud services that support library operations and deliver digital resources. (Odunlade & Ojo, 2023). Staff digital competence refers to librarians' technical and information literacy skills that enable effective management of electronic resources virtual reference and data analytics. (Ogunbodede & Atchrimi, 2024). User access involves the availability and usability of electronic resources for individuals across varying locations and abilities. (Iguehi & Udem, 2022). Organizational policy denotes governance structures strategic planning and management frameworks critical for sustaining digital library services (Akintola, et al., 2020). Together these variables illustrate that successful digital transformation requires a holistic managerial approach rather than simple technology deployment.

Recent empirical studies provide concrete insights into how these variables intertwine in practice. Odunlade and Ojo (2023) examined eighteen academic libraries in south west Nigeria assessing the use of kiosk QR code and RFID technologies. Their descriptive survey demonstrated modest increases in patron engagement where digital tools were implemented but underscored persistent

limitations due to inadequate funding and infrastructure. They recommended institutional policies and public private partnerships as strategic solutions. Afolabi et al (2024) surveyed seventy-one library staff in private universities in Osun state to evaluate cloud-based system adoption and electronic resource utilization. While uptake was apparent digital integration remained constrained by financial challenges leading the authors to urge formal curriculum integration and proactive resource promotion. Regina (2024) employed a descriptive design within university libraries in the Niger Delta region and reported that digitization contributed to improvements in access, preservation, institutional visibility and service quality. Nevertheless unstable internet and power supply introduced serious obstacles prompting calls for collaboration between librarians, faculty members and technology providers. Nwawih et al. (2022) undertook a policy analysis on governance models for electronic information systems in academic settings. They determined that although broad policy frameworks exist, detailed sustainability planning was often absent a gap that undermines long-term digital adoption. Ezeibe et al. (2025) investigated cloud computing competencies among librarians in federal universities in South South and South East Nigeria. Their census study in eleven institutions revealed strong correlations between cloud competencies and service quality leading to recommendations for expanded training initiatives. Iguehi and Udem (2022) studied the nature of innovative digital transformation in Nigerian university libraries. Their conclusion underscored that digital transformation is essential to sustain dynamic services, and they urged increased funding, adoption of advanced technologies, leadership engagement, and continuous staff development. Collectively, these empirical studies affirm the centrality of digital infrastructure, staff skills, policy frameworks

and external partnerships in shaping effective digital library service management.

This study is grounded in socio-technical theory. This theory asserts that organizational effectiveness in adopting new technology depends on the harmonious integration of technical systems and social components including people processes and culture. The underlying premise is that technology is not simply installed but is shaped by and shapes the human and organizational environment in which it operates. Advocacy for joint optimization suggests that neglecting either domain leads to breakdowns, inefficiency or failure. A noted critique is its occasional underestimation of broader external influences such as governmental policy or market dynamics. Despite this limitation socio-technical theory offers a robust analytical lens for this research. It enables examination of how digital infrastructure, staff competence, user engagement and organizational policy interrelate within Nigerian academic library settings thereby guiding actionable managerial strategies.

Despite the valuable contributions of prior research, significant gaps persist. Many studies examine individual variables in isolation rather than developing an integrated model. The predominant dependence on cross sectional designs limits understanding of how digital maturity evolves longitudinally. Proposed interventions, such as training, funding or partnerships, are often generic, lacking context specific analysis and prioritization. Moreover scholarly attention has been heavily weighted toward southwestern Nigeria or private university settings whereas public federal or northern region libraries remain understudied. Finally theoretical frameworks such as socio-technical theory are frequently mentioned but rarely operationalized in empirical investigations reducing explanatory power. These deficiencies make clear the necessity of a contextually grounded qualitative study that integrates variables

within a theoretically informed framework and draws on diverse librarians' perspectives.

In summary, review of current literature shows that digital infrastructure, staff competence, user access and organizational policy are essential components in managing academic library services in the digital age. Empirical evidence validates their importance while identifying key challenges including funding, infrastructure, unreliable power and connectivity. Socio-technical theory provides an appropriate conceptual foundation for understanding the complex interplay of social and technical subsystems in library contexts. However internal integration longitudinal insight, contextual specificity and theoretical operationalization remain lacking thereby underscoring the imperative for this study. Therefore, this study seeks to develop a contextually relevant socio-technical model informed by practitioner experiences to inform effective management of digital library services.

Methodology

The study adopted a mixed methodological design that combined empirical insights from existing research with conceptual analysis of theoretical frameworks. The empirical component relied entirely on secondary data, while the conceptual component entailed synthesizing models relevant to digital academic library management. No interviews or direct surveys were conducted, making the approach strictly non-intrusive and document-based.

To generate the empirical corpus, a structured literature search was conducted between April and July 2025 using three academic databases: Scopus, Web of Science, and Google Scholar. The search strategy employed Boolean operators and combinations of keywords such as digital academic libraries, academic library management, electronic resource governance, ICT in university libraries, digital preservation, and library transformation strategies. The search yielded

seventy-four documents. After a two-stage screening, forty documents were retained for analysis. The first stage of screening excluded duplicates, non-English texts, and documents outside the discipline of Library and Information Science. The second stage excluded publications whose focus was not on the management of digital library services, such as purely technical ICT deployment papers with no managerial or operational context. This ensured that only studies directly relevant to the research variables were included.

The publications covered the period 2015 to 2025, allowing the study to capture both recent developments in digital transition and trends over the last decade. This periodicity was justified by the need to reflect contemporary realities while not ignoring foundational transitions that began before the COVID-19 pandemic, which significantly influenced digital adoption in academic libraries. Among the final forty documents, twenty-four were empirical studies involving survey, descriptive, or case study designs; nine were policy or institutional reports; and seven were conceptual or review-based contributions. In addition, sixteen theoretical and conceptual frameworks were considered during the conceptual analysis stage.

Inclusion criteria required that a study, firstly, addressed one or more of the four core variables of the study, digital infrastructure, human capacity, user access, or organizational policy; secondly, was published in a peer-reviewed journal, reputable conference proceeding, or institutional/governmental report; and thirdly, contained extractable data on aims, design, instruments, findings, and conclusions. Exclusion criteria ruled out publications that; lacked methodological clarity; focused solely on software or hardware without managerial implications; or offered opinion pieces without empirical or conceptual grounding. This selection ensured that the evidence base was rigorous,

verifiable, and directly aligned with the objectives of the study.

Data extraction involved coding each selected study for research aim, variables considered, design and sample size (where applicable), instruments used, reliability and validity evidence (if reported), statistical or analytical tools employed, findings, conclusions, and recommendations. This coding enabled the creation of structured evidence tables that informed the presentation of results. For conceptual analysis, theoretical models were examined in terms of their assumptions, propositions, limitations, and applicability to the management of academic libraries.

Data analysis proceeded in two streams. Empirically, the extracted findings were grouped under four themes, digital infrastructure, human capacity, user access, and organizational policy, and compared across institutions and national contexts to identify convergence and divergence. Conceptually, sociotechnical theory was used to evaluate how human, organizational, and technical factors interact in digital library management. Integration of both streams generated a refined framework for managing academic library services in the digital age. Data reported in the findings and analysis of

this study were purposely selected to avoid repetition of identified data from similar studies with concurrent findings.

As the study used secondary data only, ethical approval was not required. Nonetheless, all documents were handled with academic integrity by citing original authors, acknowledging their findings, and ensuring transparency in reporting inclusion and exclusion decisions.

Findings and Discussions

Perceived Benefits and Opportunities Afforded by Digital Transformation in Academic Library Services

Academic libraries are increasingly adopting digital technologies to improve their services. Several studies reviewed the benefits and opportunities accomplished with digital transformation in academic libraries, however, few of the studies were selectively analyzed to avoid duplication or repetition of reported data and focused on the core achievement of digital transformation in academic libraries. Table 1 presents data on the perceived benefits and opportunities that have emerged from the digital transformation of academic library services.

Table 1: Quantified Benefits and Opportunities from Digital Transformation in Academic Libraries

S/N	Identified Benefit / Opportunity	Data Reported	Source
1	Increase in remote access to e-resources	50 percent increase	Regina (2024)
2	Preservation of fragile printed titles via digitization	Over 2 000 titles	Afolabi, Oyebola & Komolafe (2024)
3	Computerised cataloguing and circulation	100 percent of libraries surveyed	Omotunde et al. (2023)
4	Growth in ICT tool adoption for core routines	Slow internet and funding noted as barriers	Omotunde et al. (2023)
5	Recognition of digital engagement as essential for longevity	100 percent of staff agreed	Oguedoiu (2023)

The data in Table 1 demonstrate the measurable advantages of digital transformation in academic libraries. Regina (2024) reported a 50 percent rise in remote

access after e-resource implementation, indicating that digital collections significantly improve accessibility. Afolabi et al. (2024) recorded over 2 000 fragile titles preserved digitally, underscoring the role of digitization

in collection longevity. Omotunde et al. (2023) found that all surveyed academic libraries (100 percent) had computerized their cataloguing and circulation systems, reflecting widespread automation of core functions. The same study highlighted infrastructure gaps, particularly slow internet and funding deficits that need addressing. Oguedoiu (2023) observed unanimous staff consensus on the necessity of digital engagement for library sustainability, signifying strong institutional alignment with digital objectives. Together, these findings provide compelling evidence that digital transformation yields significant improvements in access, preservation, operational efficiency, and staff commitment,

thereby addressing the first research objective.

Operational, Technological, and Organizational Challenges Affecting Digital Transition

Academic librarians consistently report that the transition to digital services is seriously hampered by interrelated operational, technological, and organizational barriers. These barriers were cross-referenced across several studies, though the major challenges are analyzed and reviewed as presented in Table 2. Below is a quantified summary of these challenges as reported in multiple studies.

Table 2: Major Challenges in Digital Transition of Academic Libraries

S/N	Challenge	Data Reported	Source
1	Lack of formal policy on digital services	Mean = 3.87 (Strongly agree)	Igbo et al. (2022) (Table 5)
2	Lack of platform for online reference services	Mean = 3.85 (Strongly agree)	Igbo et al. (2022) (Table 5)
3	Poor staff skills in digital resource application	Mean = 3.83 (Strongly agree)	Igbo et al. (2022) (Table 5)
4	Poor funding of university libraries	Mean = 3.80 (Strongly agree)	Igbo et al. (2022) (Table 5)
5	Frequent interruption of electricity	Mean = 3.60 (Strongly agree)	Igbo et al. (2022) (Table 5)
6	Users' lack of skill in using online resources	Mean = 3.53 (Strongly agree)	Igbo et al. (2022) (Table 5)
7	Low Internet bandwidth	Mean = 3.47 (Agree)	Igbo et al. (2022) (Table 5)
8	Inconsistent power supply	85 percent reported as a constraint	Idubor & Ogunbodede (2024)
9	Inadequate ICT facilities and infrastructure	78 percent acknowledged deficiencies	Bernard, Obiano & Osuji (2022)
10	Lack of regular ICT training for librarians	72 percent rated training opportunities poor	Idubor & Ogunbodede (2024)
11	Poor cybersecurity readiness	Only 14.6 percent of universities had IR; malware risks rated 30.6 percent	Njoku et al. (2023)
12	Malware and password attacks on library systems	Malware 62 percent; password attacks 60 percent	Okike & Adetoro (2019)

The data in Table 2 reveal that poor organizational support is the most severe problem. Igbo et al. (2022) recorded mean scores above 3.8 (on a 4-point scale) for lack of formal policies, absence of online reference services, low staff skill, and funding deficits. Electricity outages and low internet bandwidth also recorded strong agreement levels of 3.6 and 3.5 respectively. The table

also shows that 85 percent of university librarians noted inconsistent power supply as a major obstacle to digital operations (Idubor & Ogunbodede, 2024). Relatedly, 78 percent of staff from Imo State reported inadequate ICT facilities, including limited access to computing resources and workspace constraints. (Bernard et al., 2022). Most librarians also rated internal training

opportunities poorly, 72 percent indicated insufficient support for digital skills enhancement (Idubor & Ogunbodede, 2024). Organizationally, only 14.6 percent of Nigerian universities operate institutional repositories, and malware risks were notably high, at 30.6 percent (Njoku et al., 2023). Additionally, a South-West study found that 62 percent of libraries experienced malware threats and 60 percent faced password-based attacks, highlighting weak cybersecurity practices (Okike & Adetoro, 2019).

Together, these operational, technological, and organizational barriers illustrate why digital transitions struggle in Nigerian

academic libraries. They underscore the urgent need for policy frameworks, staff capacity building, infrastructural investments, and cybersecurity protocols to enable effective, sustainable digital transformation.

Best-Practice Frameworks toward Effective Digital Library Service Management

Academic libraries seeking sustainable digital transformation rely on policy frameworks, capacity building, and collaborative mechanisms. Table 3 reviews best-practice frameworks reported by selected authoritative studies, detailing their core components and prevalence.

Table 3: Best-Practice Frameworks for Digital Library Service Management

S/N	Framework Type	Key Elements	Data / Prevalence Reported	Source
1	Research Data Management Policy	Formal RDM policy including storage, software, ownership terms	20 percent of libraries possess a formal RDM policy	Igbinovia et al. (2023)
2	Professional Capacity Building	Workshops on QR code, mobile, social media, library alerts	453 librarians trained from 2016–2018 in Nigeria	Edewor (2020)
3	Digital Competency Training	Online workshops on digital platforms	109 respondents, high basic digital competency in 2024	Ogunbodede & Atchrimi (2024)
4	Mentorship in CPD Programmes	Supervisory mentoring included in CPD frameworks	Featured in all CPD programmes reviewed	Nakaziba & Ngulube (2023)
5	Regional Leadership Networks	Leadership training via INELI-SSAf	66 emerging leaders trained by 2020	AfLIA (2020)
6	Library Consortia Collaboration	Shared licensing, infrastructure, joint training	Established resource sharing in Nigerian consortium models	Bosah (2024)
7	Institutional RDM Infrastructure Support	Hardware, networks, repositories	64 percent have hardware; 46 percent run repositories	Magnus Igbinovia et al. (2023)
8	Sustainable Digital Engagement Strategy	Digital engagement via generators and solar power	100 percent consensus on need for sustainability measures	Oguedoiu (2023)

Table 3 highlights a multi-pronged framework involving policy, capacity building, and collaboration to support digital library management. At the policy level, Igbinovia et al. (2023) found that only one fifth of

Nigerian academic libraries had formal research data management (RDM) policies, while only 20 percent of academic libraries have formal RDM policies, suggesting that policy frameworks are emerging but still limited in adoption. However, the same study

reports that 64 percent have hardware infrastructure and 46 percent maintain active repositories.

As bound on capacity building strategies being notably effective, Edewor (2020) reports that 453 librarians participated in workshops covering QR codes, mobile, and social media tools. Nakaziba and Ngulube (2023) noted supervisory mentoring as a universal feature in CPD programmes they reviewed, pointing to mentorship as a cornerstone practice in skills enhancement. Also, Ogunbodede and Atchrimi (2024) found strong basic digital competencies among 109 surveyed librarians, validating the positive impact of targeted training. While on a continental scale and as reported on Wikipedia Contributors (2025, May 6), African Library and Information Associations and Institutions (AfLIA)'s INELI-SSAf programme succeeded in training 66 emerging leaders by 2020, underlining the role of regional networks in fostering innovation and digital leadership.

In the aspect of collaboration, collaboration through consortia is showing structured success. Library consortia demonstrate best practices through joint licensing, shared IT infrastructure, and professional development initiatives, functions well documented in consortia literature (Bosah, 2024). Bosah (2024) documents the establishment of shared licensing and infrastructure models in Nigerian library consortia to improve service delivery. Moreso, Ogedoiu (2023) reveals

unanimous staff agreement (100 percent) on the need for sustainable digital engagement, with specific proposals like solar power adoption, institutionalizing digital strategies.

In summary and collectively, these frameworks address digital library service management through a holistic blend of policy, human capacity, mentorship, and collaboration. The data shows that formal RDM policy presence is nascent; conversely, training initiatives and collaborative structures are well-established. The data underscore that multi-dimensional frameworks, integrating policy formulation, capacity building, regional networking, and collaboration, are critical for realizing effective digital library services. Although efforts are strong in training and collaboration, significant gaps remain in formal policy adoption and aligning strategic infrastructure investments.

Relevant Strategy for Academic Libraries Transitioning to Digital Maturity

Academic libraries transitioning toward digital maturity require well-defined strategies that integrate leadership development, investment priorities, and professional competencies. Several studies identified various relevant strategies, however, Table 4 below outlines key strategic components supported by selected current evidence to guide academic libraries through their digital evolution.

Table 4: Strategic Roadmap for Achieving Digital Maturity in Academic Libraries

S/N	Strategic Component	Description	Evidence / Prevalence	Source
1	Visionary leadership	Leaders drive digital change and remove operational barriers	Survey reported 85 percent of libraries linked digital growth to leadership engagement	Oyelude & Oladele (2014)
2	Democratic leadership style	Inclusive decision-making fosters digital innovation	Study of six Nigerian libraries found democratic style dominant	Oguntuase, Okhakhu & Fasae (2024)
3	Investment in ICT infrastructure	Funding for power, internet, storage, backup systems	Adeleke, Ojokuku & Ojo (2022) found ICT planning predicts digital maturity	Adeleke, Ojokuku & Ojo (2022)
4	Professional training programs	Workshops on QR codes, mobile tools, AI and social media	453 librarians trained between 2016 and 2018	Edewor (2020)
5	Digital competency assessment	Continuous evaluation and tailored digital upskilling	Ogunbodede & Atchrimi (2024) reported uneven advanced skills among 109 librarians	Ogunbodede & Atchrimi (2024)
6	Mentorship-based CPD	Embedding supervisor-led mentorship in development programs	Found in all CPD programs reviewed	Nakaziba & Ngulube (2023)
7	Consortium collaboration	Shared licensing, infrastructure, and training initiatives	Documented success in Nigerian consortia	Bosah (2024)
8	Sustainability planning	Policies on power backup, solar, renewables to ensure service continuity	Oguedoiu (2023) highlighted unanimous staff agreement on this need	Oguedoiu (2023)

As shown in Table 4, Oyelude and Oladele (2014) emphasized the critical role of visionary leadership in driving digital transformation; their research associated 85 percent of successful digital initiatives with proactive leadership engagement, Oguntuase et al. (2024) further observed that democratic leadership, characterized by inclusive decision processes, was prevalent in six Nigerian academic libraries and contributed notably to progress in collections and digital service innovation. Adeleke et al. (2022) demonstrated that investment in ICT infrastructure, covering key areas such as planning, storage, and networks, significantly predicted institutional digital maturity.

Capacity building is equally critical. Edewor (2020) reported that 453 librarians were

trained in digital tools such as QR codes, mobile technologies, and AI, demonstrating the value of structured training programmes. Even with training, Ogunbodede and Atchrimi (2024) found disparities in advanced digital competencies among librarians, supporting the need for ongoing skill assessment and refinement. Complementing this, Nakaziba and Ngulube (2023) identified mentorship as a constant in all CPD programs they studied, highlighting its importance in driving sustained professional growth.

At the institutional level, Bosah (2024) documented successful consortium collaborations in Nigeria through shared licensing and infrastructure, reinforcing the effectiveness of collective bargaining and training models. Lastly, Oguedoiu (2023)

found unanimous consensus among staff on prioritizing sustainability strategies such as solar power integration and backup systems, underscoring the necessity of policy frameworks to support digital resilience.

These strategic elements can combine to form a coherent, context-sensitive framework that educationally prepares academic libraries for achieving sustainable digital maturity through leadership, capacity, investment, collaboration, and resilience.

Summary of Findings

The findings paint a detailed picture of digital transformation in Nigerian academic libraries, revealing strong benefits but also significant barriers and emerging best practices. Over fifty percent of libraries reported dramatic increases in remote access after e-resource implementation, while more than two thousand fragile printed titles were preserved through digitization efforts (Regina, 2024, Afolabi et al., 2024). Computerization of core routines like cataloguing and circulation is complete across surveyed institutions (Omotunde et al., 2023), and staff view digital engagement as essential to sustainability (Oguedoiu, 2023). These outcomes demonstrate improvements in access, preservation, efficiency, resource-informed budgeting, and institutional alignment. However, persistent challenges emerge in operations, technology, and governance. Power supply remains unreliable in eighty-five percent of libraries (Idubor & Ogunbodede, 2024), while nearly eighty percent reported inadequate ICT infrastructure (Bernard et al., 2022). Training opportunities are considered insufficient by seventy-two percent of librarians (Idubor & Ogunbodede, 2024). Security vulnerabilities are evident: fewer than fifteen percent of institutions manage institutional repositories (Njoku et al., 2023), and malware and password-based attacks affect over sixty percent of libraries (Okike & Adetoro, 2019).

Best practice frameworks provide partial remedies but leave room for growth. Only twenty percent of libraries have formal research data management policies, suggesting limited strategic governance (Magnus Igbinovia et al., 2023). In contrast, capacity building has had significant impact, with 453 librarians trained in digital tools like QR codes, mobile platforms, and analytics (Edewor, 2020). Competency assessment revealed uneven digital skill levels, affirming the need for continued development (Ogunbodede & Atchrimi, 2024). Mentorship has become integral to professional development programs (Nakaziba & Ngulube, 2023), and library consortia have successfully pooled resources for shared licensing and infrastructure (Bosah, 2024). Sustainability interests are high, with full agreement on integrating backup systems and renewable solutions (Oguedoiu 2023).

In summary, the quantitative data confirm that digital initiatives bring tangible gains in service delivery, access, and preservation. Barriers in infrastructure, training, and governance, however, persist. The partial uptake of best practices, particularly in policy and strategic planning, suggests that a cohesive and integrative strategy is essential. The proposed strategy framework, based on leadership, investment, capacity building, collaboration, and sustainability, addresses these dimensions directly. It offers a pathway for academic libraries in low-resource contexts to achieve sustainable digital maturity by building on gains, bridging gaps, and institutionalizing good practices.

Conclusion

Academic libraries in Nigeria have made significant strides in digital transformation, demonstrating tangible gains in user access, preservation of fragile collections, efficient operations, data informed resource allocation, and institutional engagement. Nevertheless, persistent obstacles, such as unreliable power and internet, inadequate infrastructure, insufficient professional

development, weak governance, and cybersecurity vulnerabilities, continue to limit full digital maturity. While promising practices like capacity building workshops, mentorship, consortium collaboration, and sustainability planning are already in place, effective policy adoption and strategic alignment remain underdeveloped. A comprehensive strategy that integrates leadership commitment, targeted ICT investments, structured professional growth, collaborative networks, and resilience measures is essential. Through this integrative approach, academic libraries can consolidate their digital gains and advance toward a state of sustainable digital maturity.

Recommendations

To build on the findings and guide academic libraries toward full digital maturity, the study offers the following strategic recommendations:

1. Academic institutions should develop and implement formal research data management and digital service policies to embed digital priorities into institutional frameworks.
2. Academic institutions should invest in core ICT infrastructure, including stable electricity sources, internet upgrades, backup systems, and digital repositories, ensuring uninterrupted service provision.
3. Academic institutions should establish structured capacity building programmes focused on essential digital competencies such as analytics, artificial intelligence applications, mobile technologies, and metadata management.
4. Library management committee should introduce systematic digital competency assessments and personalized upskilling plans to address skill gaps among library staff.
5. Academic institution librarians should embed mentorship within continuous professional development initiatives to promote experiential learning and professional growth.
6. Academic institutions should join or establish library consortia to enhance resource sharing, collaboration, joint technology investments, and licensing economies of scale.
7. Academic institutions should integrate sustainability measures in digital strategy, including solar power adoption, server redundancy planning, and long-term budget allocations.
8. Academic institutions in partnership with relevant stakeholders such as NUC, NILTDA, government agencies, etc. should strengthen cybersecurity preparedness by deploying firewalls, access control systems, regular security audits, and staff training on data protection.
9. Academic institutions and concerned stakeholders should encourage democratic and visionary leadership practices that prioritize shared decision-making, innovation, and change advocacy within library management.

By implementing these recommendations, academic libraries can leverage their existing digital advances, address current limitations, and establish a clear pathway to achieving sustainable digital transformation.

References

- Adeleke A., Ojokuku Y., Ojo J. (2022). Digital Maturity of University Libraries in Nigeria. 10.5772/intechopen.103892.
- Akinade A.A., Ayodeji Y.A, Saheed A.H (2024). Perception of Librarians in Agricultural Research Institutes Towards the Use of Big Data for Library Operations and Services in Kwara State, Nigeria. *Journal of Library and*

- Information Science*, 14(1) (2024). <https://doi.org/10.17509/edulib.v14i1.60576.g27471>
- Akintola B.O., A.B, Fehintola N.O. (2020). Staff Development Policy in University Libraries in Nigeria: A Reality or Mirage. *University of Dar Es Salaam Library Journal*, Vol. 15 No. 1 (2020).
- Barclay, D. A. (2017). The Use of Academic Libraries in the Digital Age: What the Numbers Say. *International Higher Education*, (88), 11–13. <https://doi.org/10.6017/ihe.2017.88.9684>
- Bosah (2024). Consortium and Capacity Building for Nigerian Libraries of the Future. (2024). *Nigerian Library and Information Science Trends*, 5(1&2), 60–64. <https://nlist.net.ng/index.php/nlist/article/view/53>
- Edewor, N. (2020). Capacity Building Efforts to Develop Digital Innovation Competencies among Librarians in Nigeria. *Journal of Library Administration*, 60(3), 316–330. <https://doi.org/10.1080/01930826.2020.1727281>
- Ejiroghene R.E. (2024). Prospects of Digitalization Practices in Academic Libraries in Delta State, Nigeria. *IntechOpen*. doi: 10.5772/intechopen.1003195
- George H. (2023). Significance of Academic Libraries in Recent Times: A Review of Articles. *Library Philosophy and Practice*.
- Gurdish S. (2018). The Role of Academic Libraries in the Digital Transformation of the Universities. 292-296. 10.1109/ETTLIS.2018.8485258.
- Idubor I., Ogunbodede K. (2024). Digital Competencies of Librarians in University Libraries in Nigeria. 8. 9-13. 10.5281/zenodo.12586132.
- Ifeoma S.N., Buniechukwu C.N., Scholastica A. J., Chukwu R.R. (2023). Fostering Cybersecurity in Institutional Repositories: A Case of Nigerian Universities. *African Journal of Library, Archives and Information Science, African Journals Online (AJOL)*, Vol. 33 No. 1 (2023)/Articles
- Igbinovia M., Okuonghae O., Solanke O. (2023). Research Data Management in University Libraries: Evidence from Nigeria. *Rajagiri Journal of Social Development*. 15. 41-49. 10.5958/2583-7087.2023.00008.1.
- Igbo, H.U., Ibegbulam, I.J., Asogwa, B.E., Imo, N.T. (2022). Provision of Digital Information Resources in Nigerian University Libraries. *Information Research*, 27(3), paper 936. Retrieved from <http://InformationR.net/ir/27-3/paper936.html> (Archived by the Internet Archive at <https://bit.ly/3eu2rL1>) <https://doi.org/10.47989/irpaper936>
- Iguehi I., Obiora U. (2022). Innovative Digital Transformation for Dynamic Information Service Sustainability in University Libraries in Nigeria. *Folia Toruniensia*. 22. 67-86. 10.12775/FT.2022.004.
- Ijeoma I.B., Doris C.O., Chioma E.O (2022) Perceived Constraints to the Utilization of ICT Facilities in Selected University Libraries in Imo State, Nigeria, *International Journal of Library and Information Science Studies*, Vol.8, No.1, pp.33-38
- Joyce C.S., Paul S.M. (2024). Access to Library Information Resources by University Students during COVID-19 Pandemic in Africa: A Systematic Literature Review. *Cornell University - Computer Science > Information Retrieval*, <https://doi.org/10.48550/arXiv.2404.08682>
- Nakaziba, S., & Ngulube, P. (2023). Continuing Professional Development Strategies for Digital Transformation among Academic Librarians in Africa: A systematic review. *Journal of Librarianship and Information Science*, 57(1), 296-306. <https://doi.org/10.1177/09610006231207659>
- Njideka N.C.O., Stephen M., Wilson C.O. (2022). An Exploration of Policy Strategies for Sustainable EIRs in Academic Libraries Nigeria. *American Journal of Information Science and Technology*, 6(2), 16-23. <https://doi.org/10.11648/j.ajist.20220602.11>
- Odunlade, R., Ojo, J. (2023). Digital Transformation and Service Delivery in Academic Libraries: a Post Covid-19

- Approach. *Lokoja Journal of Information Science Research*, 1(1), 41-60. <https://ljsr.net.ng/lis/article/view/5>
- Ogunbodede, K., Adebayo A.I. (2024). Digital Competencies of Librarians in University Libraries in Nigeria. *Zambia Journal Of Library & Information Science (ZAJLIS)*, ISSN: 2708-2695, 8(1), 9-13. Retrieved from <https://zajlis.unza.zm/index.php/journal/article/view/132>
- Oguntuase, M.O., Okhakhu, D.O., Fasae, J.K. (2025), "Leadership styles and Collection Development Practices of Librarians in Academic Libraries: a case of Ekiti state, Nigeria", *Collection and Curation*, Vol. 44 No. 2, pp. 37-44. <https://doi.org/10.1108/CC-01-2024-0001>
- Okike B.O.I., Adetoro 'N. (2019). Are There Threats to Information System Security? a focus on university libraries in South-West, Nigeria. *Gateway Information Journal*, 20(1). Retrieved from <https://www.gatewayinfojournal.org/index.php/gij/article/view/26>
- Oluwatobi I.O, Abigail I.A, Adebayo O.K, Adefunke A.A. (2023). Cross-sectional Study on The Computerization of Academic Libraries in Nigeria. *Journal of Information Technologist (The), African Journals Online (AJOL)*, Vol. 20 No. 1 (2023)/Articles
- Opeyemi E.A., Rhoda T.O., Ranmilowo S.K. (2024). Adoption of Digital Transformation Strategies for Library Services by Private University Libraries in Osun State, Nigeria. *Samaru Journal of Information Studies, African Journals Online (AJOL)*, Vol. 24 No. 1 (2024) / Articles
- Osaheni O., Kelly O., Aminu U.M. (2019). Academic Libraries and Institutional Repository: The Nigerian Polytechnics Perspective. *Information and knowledge ManagementJournal*, Vol 9, No 9 (2019). DOI: 10.7176/IKM/9-9-02
- Oyelude, A. A., Oladele, B. A. (2014). The Leadership Dimension in Information and Communication Technology Adoption in African Libraries. *SAGE Open*, 4(1). <https://doi.org/10.1177/2158244014522071> (Original work published 2014)
- Patel A.B., Batcha M.S., Ahmad M. (2021). Investigating Awareness and Usage of Electronic Resources by the Library Users of Selected Colleges of Solapur University. *Cornell University, Computer - Digital Libraries*, 19 Feb 2021. <https://doi.org/10.48550/arXiv.2102.10917>
- Rose E., Daniel A.A., Eno O.R. (2025). Cloud Computing Competencies of Librarians and Information Service Delivery in Federal University Libraries in South-South and South-East, Nigeria. *International Journal of Research and Scientific Innovation*. <https://doi.org/10.51244/ijrsi.2025.12010003>
- Saib M.O., Rajkoomar M., Naicker N., Olugbara C.T. (2023), "Digital Pedagogies for Librarians in Higher Education: A Systematic Review of the Literature", *Information Discovery and Delivery*, Vol. 51 No. 1, pp. 13-25. <https://doi.org/10.1108/IDD-06-2021-0066>
- Wikipedia Contributors. (2025, May 6). African Library and Information Associations and Institutions. In *Wikipedia, The Free Encyclopedia*. Retrieved 07:56, June 21, 2025, from https://en.wikipedia.org/w/index.php?title=African_Library_and_Information_Associations_and_Institutions&oldid=128907048