



DISRUPTIVE TECHNOLOGIES IN ACADEMIC LIBRARIES: POLICY CONSTRAINTS AND IMPLEMENTATION CHALLENGES IN NIGERIA

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Abstract

Globally, disruptive technologies such as artificial intelligence (AI), blockchain, big data, cloud computing, and the Internet of Things (IoT) are reshaping knowledge economies. Academic libraries are increasingly expected to leverage these tools to enhance knowledge discovery, access, and preservation. In Nigeria, however, adoption has been slow and uneven. This paper examines the policy challenges that hinder the integration of disruptive technologies in Nigerian academic libraries, highlighting gaps in governance, funding, intellectual property frameworks, and alignment with international standards such as IFLA and UNESCO. Based on Nigerian scholarly literature, the study contends that policy shortcomings, rather than infrastructure or funding, are the primary obstacles to digital transformation. It concludes that, without deliberate and sustained policy reforms, Nigerian academic libraries risk marginalization in the global knowledge ecosystem and offers strategic recommendations to strengthen policy frameworks and promote sustainable technology adoption.

Keywords: *Disruptive technologies, policy challenges, academic libraries, Nigeria, ICT policy*

Introduction

The rapid rise of disruptive technologies is reshaping the global knowledge landscape at an unprecedented pace. Innovations such as artificial intelligence, blockchain, big data, cloud computing, and the Internet of Things are transforming how information is created, organized, accessed, and preserved (Klaus Schwab, 2017; OECD, 2019). In this dynamic environment, academic libraries long regarded as the intellectual heart of universities face a critical challenge: they must adapt and innovate to remain relevant or risk being sidelined in an increasingly digital world (Chigwada & Chisita, 2021; Manuel Castells, 2010).

In many countries, academic libraries have leveraged disruptive technologies to enhance service delivery, boost user engagement, and expand access to scholarly resources. Tools such as AI-powered discovery systems, cloud-based repositories, and data-driven research support services are redefining the scope and impact of library services (UNESCO, 2021; OECD, 2019). However, in Nigeria, the integration of disruptive technologies into academic libraries remains slow and uneven. While infrastructure deficits and financial limitations are often cited as key barriers, research suggests that these factors alone do not

fully explain the persistent lag in technological integration within academic libraries (Omekwu & Echezona, 2008; Ezeani & Igwesi, 2012). Recent studies confirm this trend: Okafor et al. (2023) found that despite access to basic ICT infrastructure, less than 25% of Nigerian university libraries have effectively integrated AI or cloud-based tools into routine services. Similarly, Adedayo and Olajide (2024) highlight that policy ambiguity, rather than infrastructure deficits alone, remains the primary barrier to digital transformation in Nigerian academic libraries.

Policy frameworks play a crucial role in guiding institutional responses to technological change. They set priorities, allocate resources, and provide the structure needed for sustainable innovation (Anderson, 2014; Dye, 2021). Although national ICT policies such as the National Digital Economy Policy and Strategy (NDEPS 2019–2029), the National Information Technology Development Agency (NITDA) Act, and initiatives of the Universal Service Provision Fund (USPF) are designed to drive digital transformation across sectors, they rarely address academic libraries directly. For instance, while NDEPS emphasizes digital skills development, innovation hubs, and e-governance, it overlooks the systematic integration of academic libraries into Nigeria's digital economy agenda (NITDA, 2019). Similarly, the Tertiary Education and Application Systems (TERAS) launched by TETFund in 2023 to unify repositories, journals, and scholarly materials into global open-access infrastructures excluded libraries and librarians in its design and implementation. This exclusion reflects a persistent policy blind spot: although libraries are mentioned rhetorically in national development strategies, they remain marginal in practice. This gap is even more evident when Nigeria's policy landscape is compared with global standards. Organizations such as the International Federation of Library Associations and Institutions (IFLA) and UNESCO highlight the central role of libraries in promoting digital inclusion, equitable access to information, and knowledge-driven development (IFLA, 2014; UNESCO, 2019). The relative absence of libraries in Nigeria's ICT policies reflects not only a governance gap but also a strategic oversight with long-term implications for national development.

Against this backdrop, this paper argues that the primary barrier to the adoption of disruptive technologies in Nigerian academic libraries is not merely infrastructural or financial, but policy driven. Weak governance structures, inconsistent funding, inadequate legal frameworks, and limited capacity-building strategies collectively hinder innovation and technological integration (Aina, 2019; Ubogu, 2020; Saka & Okoro, 2022). This study examines these policy challenges, explores their implications for academic libraries, and proposes strategic reforms to reposition Nigerian libraries within the global knowledge ecosystem. The discussion is situated within a broader conceptual framework of disruptive technologies and their transformative potential for academic libraries.

Conceptualizing Disruptive Technologies

The term disruptive technology was originally popularized by Christensen (1997) to describe innovations that fundamentally alter or replace existing processes, products, or services. Such technologies often emerge as simple or low-end alternatives but eventually transform entire industries by reshaping traditional practices and redefining user expectations. Within the library context, disruptive technologies refer to digital innovations that significantly enhance and restructure how information is created, organized, accessed, preserved, and disseminated while maintaining the core principles and values of library operations. Traditional services like collection development, cataloging, circulation services, reference assistance, and collection management and preservation are increasingly enhanced



by intelligent systems. For example, AI enables personalized information retrieval, predictive search, and automated metadata generation, improving both efficiency and user experience (UNESCO, 2021). Big data analytics supports research evaluation and measuring scholarly impact, while cloud computing allows remote access to digital resources and scalable storage. Blockchain technology shows promise in managing digital rights, ensuring the integrity of scholarly records, and supporting decentralized knowledge systems. IoT-enabled smart libraries feature automated inventory systems, smart shelving, and user tracking for service optimization, are redefining how both physical and digital spaces are managed (OECD, 2019; Ameen, 2019). Collectively, these advances are shifting libraries from traditional, collection-focused institutions to dynamic, user-centered, and data-driven knowledge hubs.

The transformative potential of these technologies is widely recognized. They enhance access to information, support open science, improve operational efficiency, and strengthen the role of libraries in research and innovation ecosystems (IFLA, 2018; Tenopir, 2020). For developing countries like Nigeria, they provide pathways to bridge information gaps, promote inclusiveness, enhance the global visibility of research outputs, and support national development goals.

However, adoption is neither automatic nor uniform. Technological transformation in libraries depends on institutional readiness, human capacity, infrastructure, and critically, policy frameworks (Ezeani & Igwesi, 2012; Saka & Okoro, 2022). Without enabling policies that provide strategic direction, funding, and governance structures, the benefits of disruptive technologies remain largely unrealized. This highlights the importance of examining both technological possibilities and the policy environments that enable or constrain their adoption.

Policy Frameworks and Governance of Academic Libraries in Nigeria

Despite the recognized potential of disruptive technologies, Nigerian academic libraries remain at the periphery of the country's digital transformation agenda. National frameworks such as the National Digital Economy Policy and Strategy (NDEPS 2019–2029), the NITDA Act, and initiatives under the Universal Service Provision Fund (USPF) articulate ambitious goals for digital inclusion, broadband expansion, and innovation. However, these frameworks rarely position academic libraries as central stakeholders in their implementation (NITDA, 2019; FMCDE, 2020).

The effective integration of disruptive technologies depends on clear, coherent, and robust policy frameworks at both national and institutional levels. In more advanced contexts, such frameworks enable coordinated adoption, sustainable funding, and accountability in digital innovation. By contrast, the limited recognition of libraries within Nigeria's policy environment has resulted in fragmented and inconsistent approaches to technological integration (Anderson, 2014; Dye, 2021). This omission creates a structural disconnect. While universities are expected to drive research and innovation, the libraries that support these functions are not systematically integrated into national ICT strategies. As a result, academic libraries face uneven technology adoption, weak infrastructure support, and limited institutional backing for innovation (Omekwu & Echezona, 2008; Ezeani & Igwesi, 2012).

Recent studies reinforce the systemic nature of this challenge. Umoren and Kolawole (2024) emphasize the need for continuous policy reform and stronger stakeholder collaboration to position libraries within Nigeria's digital economy. Supporting this, Nwokedi and Chukwu (2023) report that inconsistent institutional ICT policies across five federal universities have resulted in fragmented adoption of cloud-based, AI-driven library services,

demonstrating that governance weaknesses remain a key impediment to innovation. Similarly, Sunusi (2020) and Owolabi et al. (2020) argue that persistent challenges—often framed as infrastructural or financial, are rooted in deeper governance and policy deficiencies. A clearer contrast emerges when Nigeria's policy environment is compared with international frameworks such as the IFLA Internet Manifesto and UNESCO's Information for All Programme (IFAP). These frameworks explicitly recognize libraries as central actors in promoting digital inclusion, knowledge access, and lifelong learning (IFLA, 2014; UNESCO, 2019). In Nigeria, however, policy emphasis on innovation and economic competitiveness rarely translates into defined roles for academic libraries.

Consequently, Nigerian academic libraries remain constrained by weak policy integration, limiting their ability to adopt and scale disruptive technologies. Addressing these governance gaps is essential to reposition libraries as critical knowledge infrastructures within Nigeria's digital transformation agenda.

Policy Gaps and Implementation Challenges

At the institutional level, several policy deficiencies significantly hinder the adoption of disruptive technologies in Nigerian academic libraries. A fundamental challenge is the absence of a formalized and forward-looking institutional ICT master plan that explicitly integrates library digital strategies. In many cases, technology acquisition is ad hoc and largely driven by vendor proposals rather than guided by a coherent institutional framework. This lack of strategic direction results in fragmented technology systems and poor interoperability, limiting the integration of advanced tools such as artificial intelligence and big data analytics across university ecosystems (Oname & Alex-Nmecha, 2020; Sunusi, 2020).

Funding policies further constrain technological advancement. Existing institutional budget frameworks tend to prioritize recurrent expenditures over the capital and maintenance investments required for digital innovation. Most universities lack policy provisions that dedicated ring-fence funding for library technologies, including digital resource licensing, infrastructure maintenance, and system upgrades (Ubogu, 2020; Aina, 2019). As a result, many technology initiatives are either abandoned or fail to scale, leading to inefficient use of resources and rapid deterioration of installed systems.

Legal and regulatory gaps also pose significant challenges. Despite national reforms such as the Copyright Act 2022 and the Nigeria Data Protection Act 2023, many universities have yet to translate these frameworks into actionable institutional policies. Academic libraries often lack clear guidelines on repository licensing, data protection protocols, and user consent mechanisms. This creates uncertainty and exposes institutions to risks of legal noncompliance, particularly in the deployment of automated and AI-driven systems that rely on user data (Oriakhogba, 2023).

In addition, human resource policies have not kept pace with technological change. Many universities do not mandate or incentivize continuous professional development in critical areas such as data science, cloud computing, and artificial intelligence. This results in a significant skills gap, leaving librarians ill-equipped to manage emerging technologies and contributing to resistance to change and underutilization of digital systems (Saka & Okoro, 2022).

The lack of standard implementation guidelines and accountability frameworks further weakens institutional capacity for innovation. Without clear governance structures that position libraries as strategic ICT hubs, technology adoption remains inconsistent and



poorly coordinated. As Ocholla (2020) observes, institutional ICT policies that fail to integrate libraries contribute to their marginalization within broader digital transformation agendas. The absence of performance benchmarks and monitoring mechanisms also makes it difficult for libraries to evaluate progress or justify investments in advanced technologies.

At the national level, a broader policy disconnect reinforces these institutional challenges. Although Nigeria has developed multiple ICT frameworks, including the National IT Policy (2001) and the National Digital Economy Policy and Strategy (2020), these policies rarely articulate the role of academic libraries within the national innovation system (Iwhiwhu & Eyekpimi, 2018). This omission forces libraries to operate without clear strategic direction, resulting in fragmented and inconsistent adoption of disruptive technologies (Emezie, 2021). These policy gaps are further illustrated by the mismatch between national digital goals and the realities within academic libraries, as shown in Table 1.

Table 1: Policy Goals vs. Library Realities in Nigeria's Digital Economy

S/N	NDEPS Policy Goal	Library Reality	Sources
1	Digital Literacy and Skills Development	Librarians are not systematically included in national digital training programs; capacity building is ad hoc	Ezeani & Igwesi (2012); Saka & Okoro (2022)
2	Broadband and Infrastructure Expansion	Many academic libraries have unreliable and costly internet access; limited involvement in USPF initiatives	Omekwu&Echezona (2008)
3	Digital Innovation and Service Infrastructure	Libraries are not designated as innovation hubs despite their role in knowledge dissemination	Uwaifo& Osagie (2024)
4	Legal and Regulatory Frameworks	Weak institutional policies on copyright, data protection, and digital repositories hinder implementation	Oriakhogba (2023)
5	Promotion of Emerging Technologies (AI, IoT, Blockchain)	Adoption remains experimental due to lack of policy guidance and funding	Saka & Okoro (2022)
6	Local Content and Knowledge Development	Institutional repositories lack sustainability, standards, and interoperability	Anyaoku&Ozioko (2023)
7	Inclusive Digital Policy Development	Academic libraries are not explicitly recognized as stakeholders in national ICT policies	Omekwu&Echezona (2008)

The evidence in Table 1 highlights a critical issue: while Nigeria's digital policies are ambitious, their implementation does not align with the operational realities of academic libraries. This misalignment leads to underutilization of existing technologies, duplication of efforts, and missed opportunities for innovation. Moreover, the lack of coordination between national policies and institutional practices creates a fragmented ecosystem. Libraries cannot function as integrated hubs for digital learning and research but remain constrained by policy limitations that restrict their growth and relevance. Addressing these gaps requires more than drafting policies. It demands intentional inclusion of libraries in policy development, clear

implementation strategies, sustainable funding mechanisms, and ongoing monitoring. Without these elements, the vision of a digitally transformed academic library system in Nigeria will remain largely aspirational.

Consequences of Policy Failure and Implementation Challenges in Nigerian Academic Libraries

Policy failures within Nigeria's higher education and digital economy sectors have far-reaching implications for academic libraries, affecting technology adoption, research visibility, human capacity, service delivery, and operational sustainability.

1. Limited Technology Adoption and Service Inefficiencies

Although awareness of disruptive technologies is increasing, their adoption remains limited due to weak institutional policies and inadequate strategic support. Ajibade (2024) reports that while many librarians are familiar with artificial intelligence (AI), only a small proportion have adopted it in practice, largely because of insufficient infrastructure and institutional backing. Recent surveys by Ezeani et al. (2025) corroborate these findings, showing that over 70% of librarians in six Nigerian universities cited unclear ICT policies and lack of ring-fenced funding as the primary barriers to AI, big data, and cloud computing adoption. Similarly, Igbashal and Tyonum (2023) found that research support services in Nigerian academic libraries lag behind global standards in deploying advanced tools such as AI-driven analytics, primarily due to governance and policy deficiencies. Policy gaps also contribute to operational inefficiencies, as ineffective maintenance policies and weak staff development structures lead to delays, duplication of effort, and unsatisfactory user experiences (Uwaifo & Osagie, 2024; Ogunyade & Onifade, 2012).

2. Poor Research Visibility

Weak policy frameworks have hindered the effectiveness of institutional repositories (IRs), critical for preserving and disseminating scholarly outputs. The absence of clear governance mechanisms, such as deposit mandates, copyright guidelines, and standardized metadata practices, results in inconsistent usage and poor international visibility of Nigerian research outputs. Consequently, Nigerian universities face reduced participation in global knowledge networks, limiting collaboration opportunities and constraining academic impact (Anyaku & Ozioko, 2023; Ezeani & Igwesi, 2012).

3. Skills and Capacity Gaps

The lack of structured professional development policies contributes to persistent human capital gaps. Many librarians, despite recognizing the potential of AI and other disruptive technologies in cataloguing, procurement, and search optimization, lack training and expertise necessary for effective deployment. Evidence from the University of Nigeria, Nsukka, indicates that prerequisites for technological adoption policy documentation, technical expertise, infrastructure, and reliable data, are frequently absent, leaving institutions unprepared for digital transformation (Ezeani & Nwachukwu, 2023; Saka & Okoro, 2022). This evidence is also replete in other academic libraries in Nigeria.

4. Risks to Data Privacy and Institutional Reputation

Inadequate data governance and privacy policies expose academic libraries to legal and ethical risks. Automated systems, digital repositories, and AI tools rely on personal and



institutional data. Despite the introduction of the Nigeria Data Protection Regulation (NDPR) in 2019, many universities lack internal compliance frameworks. This increases the risk of data breaches, undermines user trust, and can damage institutional reputation. Weak policies also affect global visibility: inconsistent repository practices and the absence of self-archiving mandates limit the accessibility of Nigerian scholarship in international indexing systems (Business Day, 2021; Anyaoku & Ozioko, 2023; Ezeani & Igwesi, 2012).

5. Operational and Infrastructural Constraints

Beyond policy deficiencies, practical implementation of disruptive technologies is hampered by several infrastructural challenges:

- **Inadequate ICT Infrastructure:** Many libraries operate with outdated hardware and networking equipment that cannot efficiently support AI, cloud computing, or big data analytics. Poor standardization often results in “technology islands,” where new systems cannot integrate with existing library management platforms.
- **Erratic Power Supply:** Frequent outages require reliance on expensive generators or inverters, increasing operational costs and limiting the reliability of automated systems. Without consistent 24/7 power, services such as AI-driven cataloguing and digital repositories become unsustainable.
- **Low Bandwidth and Connectivity:** Limited internet bandwidth restricts the performance of data-intensive applications, real-time analytics, and streaming services, frustrating users and discouraging adoption of new technologies.
- **High Costs and Unsustainable Maintenance:** Advanced technologies often require foreign currency for software licenses or cloud subscriptions. Combined with limited local vendor support, the lack of predictable funding undermines long-term sustainability.
- **Hardware Obsolescence and System Integration Issues:** Rapidly outdated hardware and poor planning for integration with existing ILMS systems fragment library services and reduce the effectiveness of investments in new technologies.

The combination of policy failures and operational constraints significantly limits the ability of Nigerian academic libraries to adopt and sustain disruptive technologies. Without coherent policies, dedicated funding, structured capacity-building programs, and robust infrastructural support, libraries cannot function as dynamic knowledge hubs. Addressing these challenges requires deliberate reforms that link national and institutional policy with practical implementation strategies, ensuring that Nigerian academic libraries can fully contribute to research, teaching, and knowledge dissemination in the digital age.

Conclusion

The adoption and integration of disruptive technologies in Nigerian academic libraries are constrained primarily by policy shortcomings rather than the mere absence of infrastructure or funding. Weak governance structures, fragmented institutional policies, inconsistent or unprotected funding, inadequate capacity-building programs, and insufficient operationalization of national legal frameworks collectively limit libraries' ability to innovate, deliver efficient services, and support research effectively. These policy deficiencies exacerbate operational and infrastructural challenges, including unreliable power supply, limited bandwidth, outdated hardware, high maintenance and licensing costs, and integration difficulties with existing library systems. Consequently, academic libraries remain peripheral

to the national digital transformation agenda, underutilizing technological opportunities, limiting global visibility of research outputs, and perpetuating human capital gaps.

Without deliberate, coordinated, and sustained reforms at both national and institutional levels, Nigerian academic libraries risk further marginalization in the global knowledge economy. Addressing these challenges requires a holistic approach that integrates policy reform, dedicated funding, governance restructuring, capacity building, and infrastructure enhancement to fully realize the transformative potential of disruptive technologies.

Recommendations

To enable Nigerian academic libraries to adopt, sustain, and scale disruptive technologies, the following strategic actions are proposed:

1. Academic libraries should be formally recognized as key stakeholders in national digital economy policies, including NDEPS. Policies must clearly define libraries' roles in digital literacy, innovation, equitable knowledge access, and research support.
2. Universities and agencies such as TETFund should establish predictable funding allocations specifically for library ICT infrastructure, digital resource licensing, system upgrades, and maintenance. This ensures sustainability beyond pilot projects or donor interventions.
3. Universities should adopt library-specific ICT policies that outline responsibilities, accountability frameworks, performance benchmarks, and procedures for technology adoption. Strong governance ensures coordinated, consistent, and scalable integration of disruptive technologies.
4. Librarians should undergo structured training in AI, big data analytics, cloud computing, digital curation, and related emerging technologies. National and institutional bodies, including LRCN, should mandate professional development and encourage partnerships with international libraries and technology organizations.
5. National legislative reforms, such as the Copyright Act 2022 and Nigeria Data Protection Act 2023, must be translated into actionable institutional policies. Clear guidelines on digital rights management, data protection, and repository licensing are critical to mitigate legal and ethical risks.
6. Libraries require reliable power supply, high-speed internet connectivity, modern hardware, and compatible system integration protocols. Planning should prioritize interoperability with existing Integrated Library Management Systems (ILMS) and other campus technologies to prevent fragmentation and maximize utility.
7. Nigeria should draw lessons from successful African models (e.g., South Africa, Kenya) and global frameworks (IFLA, UNESCO) to align policy, governance, funding, and capacity-building strategies with international standards, ensuring libraries serve as effective knowledge hubs.

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