

FROM TYPEWRITER TO ARTIFICIAL INTELLIGENCE: A CENTURY OF TECHNOLOGICAL SHIFTS IN NIGERIAN UNIVERSITY EDUCATION

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Abstract

Over the past seven decades, Nigerian university education has experienced significant technological transformation, evolving from the use of chalkboards, printed notes, and manual typewriters to modern information and communication technologies (ICT) and emerging artificial intelligence (AI) applications. This paper examines five major phases of this evolution: early audiovisual aids and manual typewriting in the mid-twentieth century; the rise of broadcast media and micro-teaching in the 1970s and 1980s; the ICT and e-learning revolution in the 2000s and 2010s; the expansion of computerized assessment and online learning in the 2010s and early 2020s; and the current integration of AI in teaching, learning, and academic support services. Using archival records, policy documents, and recent empirical studies, the paper identifies key drivers such as national ICT policies, institutional leadership, and professional development, alongside challenges including inadequate infrastructure, limited funding, digital literacy gaps, and socio-cultural resistance. The study concludes by proposing a framework for inclusive and responsible AI-driven transformation in Nigerian universities emphasizing infrastructure, capacity building, ethical governance, and continuous evaluation to support a future-ready and equitable university system.

Keywords: Educational Technology, Typewriter, ICT, e-learning, Artificial Intelligence, Nigerian universities

Introduction

The history of Nigerian university education is inseparable from the history of technology. As universities have expanded their mandates in teaching, research, and community service, they have continually sought tools that could enhance knowledge transmission, improve efficiency, and widen access. Globally, higher education has moved from print-based instruction to broadcast media, then to digital and networked learning, and now toward data-driven and intelligent systems (Agbarakwe, & Chibueze, 2024). In Nigeria, this trajectory has unfolded within a context marked by colonial legacies, post-independence nation building, fluctuating economic fortunes, and persistent infrastructural challenges.

In the early decades of Nigerian universities, teaching and learning were dominated by face-to-face lectures supported by chalkboards, printed handouts, and manual documentation. The introduction of audiovisual aids in the mid-twentieth century represented the first attempt to enrich instruction through technology. Over time, radio, television, and micro-teaching studios enabled more mediated forms of pedagogy, particularly in teacher education. The turn of the twenty-first century, however, marked a more radical shift. The diffusion of computers and internet connectivity opened Nigerian universities to global information flows, transforming libraries, classrooms, and administrative systems. Learning management systems, digital repositories, and virtual classrooms redefined access to knowledge and enabled distance education on an unprecedented scale.

More recently, advances in artificial intelligence especially in natural language processing, adaptive learning, automated assessment, and data analytics have introduced new possibilities for personalized learning and institutional decision-making (Agbarakwe, & Chibueze, 2024). Although AI adoption in Nigerian universities remains nascent, it has generated significant interest among policymakers, administrators, and educators seeking to modernize higher education and align it with the demands of the digital economy. Despite these developments, technological integration in Nigerian universities has been uneven and often fragile. While some institutions have emerged as pioneers, many others struggle with unreliable power

supply, limited broadband access, inadequate funding, and insufficient staff capacity (Ogunode., Idoko, & Peter, 2024). Policies have frequently articulated ambitious visions, yet implementation has lagged behind rhetoric. This paper situates contemporary AI adoption within a longer historical arc of technological change in Nigerian higher education. It maps five major phases of evolution, examines the drivers and barriers shaping each phase, and analyses policy and institutional responses over time. By doing so, it seeks to answer three interrelated questions: How has educational technology evolved in Nigerian universities over the past century? What factors have enabled or constrained these shifts? And what lessons can guide the responsible integration of AI in the years ahead? The paper ultimately argues that sustainable AI transformation will depend not merely on acquiring new tools but on addressing long-standing structural gaps in infrastructure, capacity, governance, and equity.

Historical Phases of Technology in Nigerian Universities

The evolution of educational technology in Nigerian universities can be understood as a sequence of overlapping phases, each shaped by global technological trends and local socio-political realities. These phases did not replace one another neatly; rather, new technologies were layered upon existing practices, producing hybrid systems in which analogue and digital tools often coexisted. Together, they reveal a pattern of gradual modernization punctuated by moments of accelerated change (Babalola, & Aramide, 2020).

Phase I: Early Audio-Visual Aids and Manual Typewriters (1950–1970)

The foundations of educational technology in Nigerian higher education were laid during the colonial and early post-independence periods. Instruction was largely lecture-based, reflecting British academic traditions, but educators increasingly experimented with visual and auditory aids to enhance comprehension and standardize teaching. Chalkboards, charts, slides, overhead projectors, filmstrips, and educational films became common features in classrooms, especially in science and teacher education (Babalola, & Aramide, 2020).

By the early 1960s, universities such as the University of Ibadan had established audiovisual units, often with support from international organizations like UNESCO. These units produced instructional materials, managed film libraries, and trained staff in media use. Similar centres later emerged at Ahmadu Bello University, the University of Lagos, Obafemi Awolowo University, and the University of Nigeria, Nsukka. The creation of these units marked the institutionalization of educational media services and signaled early recognition of technology's pedagogical value (National Information Technology Development Agency, 2023).

Alongside audiovisual tools, manual typewriters played a central role in academic life. They were indispensable for preparing lecture notes, typing theses, producing examination scripts, and training students in business and secretarial studies. In many universities and colleges of education, mastery of the typewriter symbolized modern office competence. However, the mechanical nature of typewriters limited editing flexibility and efficiency, and their continued use into the late twentieth century increasingly appeared anachronistic as word-processing technologies advanced elsewhere. Pedagogically, this phase remained largely teacher-centred. Technologies were deployed to support existing instructional methods rather than to transform them. Yet the period was significant in that it introduced Nigerian universities to systematic technology use, created professional roles in educational media, and laid the groundwork for later ICT-driven reforms.

Phase II: Broadcast Media and Micro-Teaching (1970–1980)

The second phase coincided with Nigeria's rapid expansion of education following the oil boom of the 1970s. Demand for trained teachers and standardized instruction encouraged experimentation with broadcast media and video technologies. Educational radio and television programmes were used to supplement lectures, disseminate expert knowledge, and reach wider audiences beyond individual campuses.

More transformative was the adoption of micro-teaching using closed-circuit television (CCTV) and video recording. Colleges of education and universities such as Alvan Ikoku College of Education and Obafemi Awolowo University established micro-teaching studios where trainee teachers could conduct short lessons, watch their recorded performances, and receive structured feedback. This approach shifted teacher education toward reflective practice and skills development, enabling students to analyse specific teaching behaviours such as questioning techniques, classroom management, and use of instructional aids.

Micro-teaching represented one of the earliest instances in Nigerian higher education where technology directly reshaped pedagogy rather than merely enhancing content delivery. It fostered a more interactive and learner-focused approach, emphasizing practice, feedback, and continuous improvement. Nevertheless, the high cost of equipment, technical complexity, maintenance challenges, and unreliable power supply limited widespread adoption. Only a handful of relatively well-resourced institutions could sustain such facilities. Despite these constraints, this phase marked a conceptual shift toward mediated and technology-informed pedagogy that would later be amplified by digital tools.

Phase III: ICT Revolution and the Emergence of E-Learning (2000–2010).

The turn of the twenty-first century ushered in a digital revolution in Nigerian universities. The diffusion of personal computers, mobile devices, and internet connectivity transformed how information was accessed, stored, and shared. Universities began establishing computer laboratories, ICT directorates, and campus networks to manage growing digital infrastructure. Federal policy interventions played a crucial role in this phase. The National Policy on ICT in Education (2010) and subsequent implementation guidelines articulated a vision of ICT as a catalyst for educational quality, access, and efficiency (Federal Republic of Nigeria., 2010). Agencies such as the National Information Technology Development Agency (NITDA) supported capacity building through training programmes and equipment distribution, while telecommunications liberalization expanded internet availability (National Information Technology Development Agency, 2023; Agbarakwe, & Chibueze, 2024).

E-learning platforms and learning management systems (LMS) emerged as central tools for blended learning. Systems such as Citadel E-Learning enabled lecturers to upload course materials, administer quizzes, and interact with students online (Awodele, Kuyoro, Adejumbi, & Makanju, 2011). Digital libraries expanded access to scholarly resources, reducing dependence on limited physical collections. The National Open University of Nigeria (NOUN) became the flagship of distance education, delivering programmes through virtual classrooms, online assessments, and digitized learning materials to learners across the country (Ezema Nworgu, Ebem, Echezona, Ugwu, Ezugwu, Asogwa, Ozioko, & Ukwandu, 2021).

This phase marked a shift toward more flexible and student-centred learning. Students could access resources beyond classroom hours, collaborate virtually, and engage in self-paced study. However, the benefits were unevenly distributed. Urban and better-funded institutions advanced more rapidly, while many rural campuses struggled with low bandwidth, outdated hardware, and limited technical support. The persistence of traditional lecture methods alongside emerging e-learning practices reflected both cultural inertia and infrastructural constraints. Overall, the ICT revolution redefined Nigerian universities' relationship with knowledge, positioning them within global digital networks but also exposing deep inequalities in access and capacity.

Phase IV: Computerized Assessment and Online Learning (2010–2020)

As ICT infrastructure matured, attention turned toward digitizing assessment and expanding online learning. Computer-based testing (CBT) became increasingly common for large undergraduate courses, entrance examinations, and distance learning programmes. Universities adopted CBT to manage growing enrolments, reduce examination malpractice, ensure faster grading, and improve administrative efficiency. The mid-2010s saw broader experimentation with online and blended learning, but it was the COVID-19 pandemic that forced a rapid and unprecedented shift to virtual instruction. Universities deployed platforms such as Zoom, Google Classroom, Moodle, and institution-specific LMS to sustain teaching during campus

closure (Ezema Nworgu, Ebem, Echezona, Ugwu, Ezugwu, Asogwa, Ozioko, & Ukwandu, 2021). This emergency transition revealed both the potential and fragility of Nigeria's digital readiness. While some institutions adapted quickly, many faced serious challenges: unstable power supply, insufficient bandwidth, limited access to devices for students, and inadequate staff training in online pedagogy. Studies from universities such as the University of Nigeria, Nsukka documented security concerns, low system reliability, and skills gaps that constrained effective synchronous learning.

Despite these difficulties, this phase normalized the use of virtual classrooms and digital assessment in Nigerian higher education. It accelerated digital literacy among staff and students and created institutional awareness that online learning was no longer optional but integral to modern university operations. Importantly, it also prepared the ground for more advanced applications, including AI-driven tools, by familiarizing stakeholders with data-driven and platform-based systems.

Phase V: AI Integration and Emerging Technologies (2020–2025)

The current phase represents Nigeria's entry into the era of artificial intelligence in higher education. AI applications ranging from automated grading and plagiarism detection to intelligent tutoring systems, chatbots, and recommendation engines are beginning to shape teaching, learning, and academic support services. Generative AI tools, including large language models, are increasingly used by students and lecturers for writing assistance, tutoring, and content generation, often ahead of formal institutional policies (Igbo, Imo, Jidere, & Ugwu, 2025).

Empirical studies report early adoption of AI in areas such as marketing education, where automated feedback systems correlate with improved student performance, and in academic libraries, where AI supports cataloguing, information retrieval, and research assistance (Awodele, Kuyoro, Adejumbi, & Makanju, 2011; Ibrahim, Taura, Iliyasu, & Lukman, 2024). Libraries, in particular, are exploring AI to manage growing digital collections and provide personalized user services. At the policy level, government initiatives such as the launch of a national AI Academy and the drafting of a National AI Strategy signal recognition of AI's strategic importance for human capital development and economic competitiveness. These efforts aim to position Nigeria within the global AI ecosystem while addressing skills gaps among students and public servants (Igbo, Imo, Jidere, & Ugwu, 2025).

Yet AI adoption remains nascent and uneven. Many universities lack the computational infrastructure, reliable data systems, and skilled personnel required for advanced AI deployment. Ethical concerns relating to data privacy, algorithmic bias, academic integrity, and potential job displacement are prominent. Socio-cultural perceptions also shape acceptance, as some educators view AI with suspicion, fearing erosion of traditional academic values. This phase marks a shift from digitization to intelligent automation and personalization (Ibrahim, Taura, Iliyasu, & Lukman, 2024). Whether AI becomes a transformative force in Nigerian higher education will depend on how effectively institutions address long-standing structural constraints while developing robust ethical and governance frameworks.

Drivers of Technological Shifts in Nigerian University Education

The trajectory of technological change in Nigerian universities has been shaped by interacting drivers and barriers that either enabled or constrained adoption across different phases.

Technological and Infrastructure Development

Key drivers include improvements in telecommunications, declining costs of digital devices, and government-backed ICT initiatives. Investments in campus fibre-optic networks, data centres, and broadband connectivity exemplified by institutions such as Obafemi Awolowo University demonstrate how infrastructure can catalyse innovation. NITDA's programmes in equipment provision and training further accelerated ICT diffusion. However, infrastructure remains uneven. Many universities still contend with erratic power supply, limited bandwidth, obsolete hardware, and inadequate maintenance (Awodele, Kuyoro, Adejumbi, & Makanju, 2011). These weaknesses constrain not only basic e-learning but also advanced applications such as cloud computing and AI, which demand stable and scalable systems.

Academic and Professional Development

The emergence of educational technology as a discipline and the formation of professional associations helped institutionalize expertise in media use and instructional design. Academic champions and specialized units advocated for technology integration, conducted research, and trained colleagues. In recent years, digitally savvy students and younger faculty have become important change agents, experimenting with online platforms and AI tools even in the absence of formal policies. Their bottom-up innovations often precede institutional reforms, highlighting the role of agency in technological change.

Barriers to Technological Shifts in Nigerian University Education

Chronic underfunding of public universities continues to constrain infrastructure renewal, research development, staff training, and technological innovation in Nigerian universities. Although government allocations to education have increased nominally in recent years, they remain significantly below international benchmarks. For example, the Federal Government allocated approximately ₦2.18 trillion to education in the 2024 budget, representing about 7.9% of total national expenditure, while the proposed 2025 allocation of ₦3.52 trillion accounted for only about 7.3% of the national budget. These figures remain far below the UNESCO recommendation of 15–20% and Nigeria's own National Policy on Education target of 26% of annual budgets devoted to education (UNESCO, 2022; National Policy on Education 2013).

Persistent funding deficits have contributed to deteriorating infrastructure, inadequate digital facilities, unreliable electricity and internet connectivity, overcrowded classrooms, and limited investment in staff development and research capacity. Capacity gaps in instructional design, data science, cybersecurity, educational technology, and AI ethics further hinder effective technology integration across universities. While national ICT and digital education policies often articulate ambitious modernization goals, implementation remains weak because of inadequate funding, fragmented institutional coordination, inconsistent leadership, and poor monitoring mechanisms.

Socio-cultural factors also shape technological adoption within Nigerian universities. Resistance to institutional change, fears of job displacement, concerns over academic integrity and plagiarism, and unequal access to digital devices and internet services influence attitudes toward emerging technologies, particularly AI-driven systems. The digital divide between urban and rural institutions, as well as between well-funded federal universities and less-resourced state institutions, further deepens inequalities in access and utilization. Consequently, technological transformation in Nigerian universities has often been incremental, uneven, and vulnerable to disruption despite growing policy attention and increased global emphasis on digital higher education.

Policy and Institutional Responses: Progress and Gaps

Nigeria's policy landscape reflects growing recognition of technology's role in higher education, yet implementation gaps persist. The National ICT Policy in Education (2010) and subsequent guidelines mandate integration across teaching, learning, and administration. More recent AI initiatives aim to build national capacity and governance frameworks. However, limited funding, weak coordination among agencies, and insufficient institutional readiness undermine policy impact. At the institutional level, universities such as Obafemi Awolowo University and NOUN illustrate what sustained leadership and investment can achieve: campus-wide networks, dedicated ICT units, LMS governance, and large-scale online delivery. Yet many universities lack comprehensive digital strategies, relying instead on fragmented projects driven by donor funding or individual champions. The result is a patchwork of adoption levels and standards across the system.

Framework for Future AI-Enabled Transformation

Building on historical lessons, a future-oriented framework for AI integration in Nigerian universities rest on five interrelated pillars: capacity building, infrastructure development, pilot implementation, ethical governance, and continuous evaluation (Igbo, Imo, Jidere, & Ugwu, 2025). First, capacity building must

extend beyond basic ICT skills to include data literacy, AI pedagogy, instructional design, and ethics for faculty, librarians, and administrators. Second, infrastructure upgrades should prioritize reliable power, broadband connectivity, secure cloud services, and scalable computing resources. Third, carefully designed AI pilot projects in assessment, tutoring, and library services can demonstrate value while allowing controlled experimentation. Fourth, clear governance frameworks are needed to address data protection, intellectual property, accountability, and fairness. Finally, continuous monitoring and evaluation should track learning outcomes, equity impacts, and system performance to guide evidence-based scaling.

Discussion

The century-long transition from manual typewriters and chalkboards to digital platforms and artificial intelligence reflects both the resilience and adaptability of Nigerian universities in the face of enduring structural constraints. Since the establishment of the first-generation universities in the mid-twentieth century, successive waves of technological innovation have consistently been presented as catalysts for educational modernization, improved teaching quality, administrative efficiency, and expanded access to knowledge. From audiovisual teaching aids and broadcast media to computers, internet technologies, e-learning platforms, and AI-enabled systems, each phase introduced new possibilities for transforming higher education. However, the outcomes of these innovations have often fallen short of expectations because of persistent infrastructural deficits, inadequate funding, weak institutional capacity, and inconsistent policy implementation.

The uneven pace of technological adoption across universities further reflects broader inequalities within Nigeria's higher education system. Federal universities located in urban centers have generally benefited from relatively better funding, international partnerships, donor interventions, and stronger ICT infrastructure, enabling them to adopt digital technologies more rapidly. In contrast, many state-owned and rural institutions continue to struggle with unstable electricity supply, poor internet connectivity, insufficient computer laboratories, and limited technical expertise. Consequently, while some universities have integrated learning management systems, virtual classrooms, and AI-supported administrative tools into their operations, others still rely heavily on traditional teaching methods and manual administrative processes. This disparity reinforces existing educational inequalities and limits the capacity of less-resourced institutions to compete in an increasingly digital global academic environment.

The emergence of artificial intelligence represents a particularly significant phase in this historical trajectory. AI technologies offer unprecedented opportunities for personalized learning, automated assessment, academic analytics, research support, virtual tutoring, and institutional efficiency. Globally, universities are increasingly deploying AI-driven tools to improve student engagement, enhance curriculum delivery, strengthen research productivity, and support data-informed decision-making. Nigerian universities are also gradually experimenting with AI applications in teaching, library services, student support systems, plagiarism detection, and administrative management. If effectively implemented, AI could improve educational access, reduce administrative inefficiencies, support adaptive learning, and strengthen the international competitiveness of Nigerian higher education institutions.

Nevertheless, historical experience demonstrates that technological innovation alone cannot guarantee meaningful educational transformation. Earlier waves of ICT adoption frequently failed to achieve their full potential because investments in technology were not accompanied by corresponding investments in human capacity development, maintenance culture, institutional reform, and governance structures. Similar risks confront the current AI transition. Without adequately trained academic staff, robust digital infrastructure, ethical governance frameworks, reliable data systems, and sustainable funding mechanisms, AI may become another underutilized innovation that widens rather than reduces educational inequalities.

Moreover, the Nigerian context presents unique socio-cultural and ethical considerations that require careful attention. Concerns about job displacement, algorithmic bias, data privacy, academic integrity, and unequal digital access shape perceptions of AI adoption within universities. Resistance to change among academic and administrative personnel may also slow implementation efforts, particularly where

technological reforms are perceived as threats to established institutional practices. In addition, disparities in students' access to internet-enabled devices and stable connectivity could deepen exclusion if AI-driven educational systems are introduced without adequate support mechanisms.

For AI to contribute meaningfully to higher education transformation in Nigeria, implementation strategies must therefore extend beyond technological acquisition. They should prioritize inclusive infrastructure development, continuous professional training, ethical and regulatory frameworks, interdisciplinary collaboration, and context-sensitive innovation policies. Equally important is the need for strong institutional leadership and long-term investment in research and digital capacity building. A sustainability-focused approach that recognizes Nigeria's economic realities and social diversity will be essential to ensuring that AI enhances educational quality and equity rather than reproducing existing structural disadvantages.

Ultimately, the historical evolution of educational technology in Nigerian universities demonstrates that successful transformation depends not merely on the availability of new technologies, but on the broader political, economic, institutional, and cultural conditions that shape their adoption and use. The AI era offers substantial opportunities, but realizing these opportunities requires deliberate, coordinated, and inclusive strategies capable of addressing the systemic challenges that have historically limited technological progress in Nigerian higher education.

Conclusion

Nigerian universities have traversed distinct technological eras: analogue instructional media, broadcast innovations, ICT and e-learning, computerized assessment, and now AI-driven systems. This evolution reveals both the system's adaptive capacity and the enduring impact of structural constraints.

Policy Recommendations

To harness AI for inclusive and sustainable transformation, the paper recommends that:

1. Federal Ministry of Education (FME), National Universities Commission (NUC), and Tertiary Education Trust Fund (TETFund) should establish a coordinated national AI capacity-building programme for universities through partnerships with technology companies, research institutes, and international development agencies. This programme should fund staff training, postgraduate scholarships, AI research hubs, and professional certification in areas such as instructional design, data science, cybersecurity, and AI ethics.
2. Federal and State Governments, in collaboration with the Nigerian Communications Commission (NCC) and Rural Electrification Agency (REA), should prioritize long-term investment in digital infrastructure by improving electricity supply, expanding broadband access to underserved campuses, and supporting rural connectivity initiatives. Universities should also be supported to develop resilient campus networks, smart classrooms, and sustainable energy systems for digital learning environments.
3. Universities, NUC, and professional regulatory bodies should integrate digital literacy, AI competencies, and technology ethics into staff development programmes and academic curricula across all disciplines. Regular training workshops, curriculum reviews, and interdisciplinary AI education initiatives should be institutionalized to ensure both staff and students can use emerging technologies responsibly and effectively.
4. The National Information Technology Development Agency (NITDA), NUC, and university governing councils should develop and enforce clear governance frameworks for AI adoption in higher education. These frameworks should address data protection, academic integrity, algorithmic accountability, ethical use of AI tools, cybersecurity standards, and equitable access for disadvantaged institutions and students.
5. Universities, TETFund, and educational research agencies should implement pilot AI projects in areas such as teaching, student assessment, academic advising, and library services, while establishing

mechanisms for continuous monitoring and evaluation. Successful pilot programmes should be scaled gradually using evidence-based models, with lessons shared across institutions to promote best practices and reduce implementation failures.

If these steps are pursued, Nigerian universities can move beyond legacy technologies such as manual typewriters and fragmented ICT systems and position themselves as dynamic hubs of innovation within Africa's knowledge economy.

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