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Aprovechando la transformación digital para la gestión sostenible de los recursos humanos y materiales en las universidades nigerianas: una revisión sistemática

Harnessing Digital Transformation for Sustainable Human and Material Resource Management in Nigerian Universities: A Systematic Review

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Investigación

Resumen

La transformación digital se ha convertido en un motor global de innovación, eficiencia y sostenibilidad en la educación superior; sin embargo, su implementación en Nigeria es dispersa e inconsistente. Este artículo examina la evidencia empírica sobre cómo las universidades nigerianas utilizan tecnologías digitales para gestionar los recursos humanos y materiales. Siguiendo las directrices PRISMA, se identificaron 25 artículos revisados por pares, publicados entre 2015 y 2025, a partir de bases de datos principales y fuentes académicas locales. Los hallazgos indican que las universidades nigerianas se encuentran en una etapa intermedia de su proceso de transformación digital, con avances considerables en plataformas de aprendizaje en línea, sistemas de gestión documental basados en la nube y aplicaciones limitadas de inteligencia artificial (IA) en la gestión de recursos humanos. Entre los beneficios reportados se incluyen una mayor eficiencia administrativa, una mejora en la transparencia y crecientes oportunidades para la sostenibilidad. No obstante, obstáculos persistentes como la infraestructura insuficiente de TIC, el acceso inestable a internet, la capacitación limitada del personal, marcos normativos débiles y restricciones financieras dificultan la integración a nivel sistémico. La revisión identifica oportunidades significativas para emplear IA, analítica de big data y sistemas de contratación electrónica con el fin de optimizar las operaciones institucionales, alinearse con las mejores prácticas globales y contribuir a los Objetivos de Desarrollo Sostenible de las

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Naciones Unidas (ODS 4, 9 y 16). El estudio concluye que se requiere una inversión sostenida en infraestructura, desarrollo de capacidades y reforma de políticas para que las universidades nigerianas puedan aprovechar plenamente los beneficios de la transformación digital en la gestión sostenible de recursos humanos y materiales.

Palabras clave: Transformación digital; universidades nigerianas; gestión de recursos humanos y materiales; inteligencia artificial (IA); infraestructura de TIC; sostenibilidad.

Abstract

Digital transformation has become a global engine of innovation, efficiency, and sustainability in higher education, but its implementation in Nigeria is scattered and inconsistent. This paper examines empirical evidence on how Nigerian universities use digital technologies to manage human and material resources. Following PRISMA guidelines, 25 peer-reviewed articles published between 2015 and 2025 were identified from major databases and local academic sources. According to the findings, Nigerian universities are in the middle of their digital transformation journey, with considerable advancements in e-learning platforms, cloud-based record management, and limited applications of artificial intelligence (AI) in human resource management. Reported benefits include increased administrative efficiency, improved openness, and rising prospects for sustainability. However, ongoing impediments like inadequate ICT infrastructure, unstable internet access, insufficient staff training, weak policy frameworks, and financial constraints impede system-wide integration. The review identifies significant opportunities to use AI, big data analytics, and e-procurement systems to improve institutional operations, in accordance with global best practices, and contribute to the United Nations Sustainable Development Goals (SDGs 4, 9, and 16). The study finds that persistent investment in infrastructure, capacity building, and policy reform is required for Nigerian universities to fully realize the benefits of digital transformation in terms of sustainable human and material resource management.

Keywords: Digital transformation; Nigerian universities; Human and material resource management; Artificial intelligence (AI); ICT infrastructure; Sustainability

Background of the Study

Universities are widely acknowledged as engines of national development as they are tasked with the production of skilled human capital, advance research and innovation, and shape societal transformation (Atuhaire et al., 2022; UNESCO, 2023). Efficient management of human and material resources forms the

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foundation upon which universities deliver their teaching, research, and community service mandates (Ofor-Douglas., 2020). In an ideal context, universities deploy robust, data-driven systems that ensure transparency, accountability, and sustainability in resource allocation (Gonugunta & Leo, 2024; Onan, 2024). Globally, digital transformation has emerged as a powerful catalyst for institutional reform and innovation. It refers to more than simple digitisation; rather, it is a holistic process of embedding digital technologies across administrative, academic, and operational processes to create agile, efficient, and future-ready institutions (Mohamed Hashim et al. (2022). In higher education, this includes learning management systems, automated procurement, cloud-based storage, AI-powered analytics for staff and student performance, and integrated human resource platforms (UNESCO, 2023). Studies across Europe, Asia, and North America have demonstrated how these tools can improve accountability, reduce duplication, enhance decision-making, and promote sustainable use of institutional resource (Bacsich & Doody, 2023).

In Nigeria, the adoption of digital transformation in universities remains uneven and fragmented (Adeoye et al., 2023). Many institutions continue to depend on manual or paper-based administrative processes for staff records, procurement, and asset tracking (Agbesanya et al., 2024). These outdated systems have been linked to inefficiency, delayed decision-making, and weak monitoring of both human and material resources (Asemota et al., 2025). Constraining factors include inadequate ICT infrastructure, unstable internet connectivity, limited training of personnel, and inconsistent policy implementation across the higher education sector (Ahmadu et al., 2025; Tertiary Education Trust Fund(TETFund) (2023).

This gap between the ideal and current reality is particularly concerning in the context of sustainability and accountability. Nigerian universities face surging enrolments, reduced public funding, and growing global competition, yet lack the digital capacity to meet these demands. Without deliberate integration of digital tools, universities risk falling further behind their global counterparts At the same time, there is no comprehensive synthesis of how far digital transformation has progressed in Nigerian universities or how it is impacting the management of human and material resources.

It is on this premise that this study synthesise evidence from multiple studies, with the aims to providing a comprehensive understanding of the extent of

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adoption, reported benefits and limitations, and opportunities for future improvement This review highlights pathways for using digital technologies to enhance efficiency, transparency, and sustainability in the higher education sector, aligning Nigerian universities with global best practices and the United Nations Sustainable Development Goals, like Goals 4 (Quality Education), 9 (Industry, Innovation, and Infrastructure), and 16 (Peace, Justice, and Strong Institutions).

Statement of the Problem

Universities are widely acknowledged as engines of national development as they are tasked with the production of skilled human capital, advance research and innovation, and shape societal transformation (Atuhaire et al., 2022; UNESCO, 2023). Efficient management of human and material resources forms the foundation upon which universities deliver their teaching, research, and community service mandates (Ofor-Douglas., 2020). In an ideal context, universities deploy robust, data-driven systems that ensure transparency, accountability, and sustainability in resource allocation (Gonugunta & Leo, 2024; Onan, 2024). Globally, digital transformation has emerged as a powerful catalyst for institutional reform and innovation. It refers to more than simple digitisation; rather, it is a holistic process of embedding digital technologies across administrative, academic, and operational processes to create agile, efficient, and future-ready institutions (Mohamed Hashim et al. (2022). In higher education, this includes learning management systems, automated procurement, cloud-based storage, AI-powered analytics for staff and student performance, and integrated human resource platforms (UNESCO, 2023). Studies across Europe, Asia, and North America have demonstrated how these tools can improve accountability, reduce duplication, enhance decision-making, and promote sustainable use of institutional resource (Bacsich & Doody, 2023).

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Statement of the Problem

Universities are meant to operate as hubs of excellence, efficiently managing human and material resources to support teaching, research, and community service. In an ideal situation, Nigerian universities would be leveraging robust digital transformation systems such as integrated human resource platforms, automated procurement processes, cloud-based data management, and AI-driven analytics to ensure transparency, efficiency, and sustainability. These systems would enable seamless staff management, real-time monitoring of institutional assets, and evidence-based decision-making aligned with global best practices in higher education (Nwachukwu & Ohalete, 2024).

However, the reality in many Nigerian universities paints a different picture. Resource management processes remain largely fragmented, paper-based, and outdated (Asabor & Alordiah, 2025). Manual recordkeeping, siloed procurement systems, and limited digital integration continue to produce inefficiencies, duplication of effort, and difficulties in tracking both human and material resources (Aleru, 2025). Infrastructural deficits, inadequate funding, insufficiently skilled personnel, and inconsistent policy frameworks have also slowed the pace of digital transformation across the higher education system, leaving most institutions lagging behind their global counterparts.

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Although digital transformation is rapidly reshaping higher education globally, there is no consolidated evidence of how Nigerian universities are adopting and applying these technologies to manage their human and material resources. Existing studies are scattered and narrowly focused on individual institutions or specific tools, making it difficult to understand the broader trends, challenges, and opportunities. This systematic review seeks to fill that gap by synthesising the existing literature, providing a clear picture of current practices, highlighting barriers, and identifying pathways for leveraging digital technologies to achieve sustainable human and material resource management in Nigerian universities.

Objectives of the study

Objectives of the Study are to

Examine the extent to which Nigerian universities have adopted digital transformation initiatives to manage human and material resources.

Analyze the impact of digital tools (AI-driven administrative systems, e-learning platforms, and digital procurement) on efficiency, transparency, and sustainability in university resource management.

Identify the key challenges and barriers that hinder effective implementation of digital transformation in Nigerian universities.

Explore opportunities and future prospects for leveraging artificial intelligence and digital technologies to improve human and material resource management in higher education institutions.

Literature Review

Digital Transformation in Higher Education

Digital transformation in higher education extends beyond digitizing paper-based processes; it involves integrating digital technologies across teaching, learning, research, and administrative functions to create agile, efficient, and future-ready institutions (Gupta et al., 2024; EDUCAUSE, 2023). Core elements include cloud-based data storage, artificial intelligence for data analysis, automated procurement systems, online learning management platforms, and integrated human resource systems (Ogbe & Uchechukwu MBA, 2024; Liu et al., 2019). These technologies have been shown to improve transparency, streamline administra-

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tive processes, and enhance decision-making capabilities in universities globally (Sule, 2024; Bo, 2024).

Several studies link digital transformation to improved institutional performance by reducing duplication of effort, enabling real-time resource tracking, and fostering innovation in university governance (Zabalawi et al., 2024; Yordanova, 2025). In advanced systems such as those in Europe, North America, and Asia, universities have adopted end-to-end platforms to manage their human and material resources efficiently, aligning institutional operations with sustainability goals (Bo, 2024).

Human and Material Resource Management in Universities

Human and material resource management lies at the heart of university effectiveness. Human resources include academic staff, non-academic personnel, administrators, and support staff, while material resources encompass physical infrastructure, laboratories, libraries, teaching equipment, and digital assets (Iloh, 2021; Gkrimpizi et al., 2023; (Ajah & Chigozie-Okwum, 2019)). Effective management of these resources directly affects teaching quality, research productivity, and student outcomes (Bisong et al., 2025). In high-performing universities worldwide, resource management systems are integrated and data-driven, allowing administrators to allocate staff workloads, monitor asset use, and plan procurement based on real-time information (Bo, 2024).

However, studies indicate that many Nigerian universities still rely on manual or fragmented systems to manage their human and material resources (Yusuf & Ibrahim, 2024; Sule, 2024). Paper-based staff records, isolated procurement practices, and poor asset tracking have been linked to inefficiencies, duplication of effort, and lack of transparency (TETFund, 2023). It is believed that when these digital systems are not adequately integrated, universities struggle to measure productivity, plan resource allocation strategically, or respond swiftly to emerging needs. Therefore the need for digital transformation which is more compelling in the Nigerian universities.

Digital Transformation Practices in Nigerian Universities

Research on digital transformation practices in Nigerian universities shows a mixed but evolving landscape. Many institutions have adopted some digital tools, such as student information systems, online course registration, virtual learning

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environments, and limited digital HR platforms (Aleru, 2025; Odoh & Nwokwu, 2024). The COVID-19 pandemic accelerated the adoption of online learning and administrative platforms, revealing both the potential of digital tools and the systemic gaps in infrastructure and capacity (Abdel et al., 2023; Nieto-Taborda and Luppicini 2024). Some universities have piloted e-procurement systems, digital libraries, and cloud-based record management, but these efforts remain uneven and often project-based rather than system-wide (UNESCO, 2023).

Studies by TETFund, (2023) and NUC, (2024) highlight the factors enabling or constraining these initiatives. Enabling factors include leadership commitment, donor or government support, and the presence of ICT directorates within universities . Conversely, barriers include inadequate ICT infrastructure, unreliable internet connectivity, insufficient training of personnel, fragmented policy implementation, and limited funding (Moshood et al., 2020; Singun, 2025). As a result, while some Nigerian universities show promising progress, many others remain in the early stages of digital transformation, lacking integrated strategies to link technology adoption with sustainable resource management.

Though there is a growing recognition of digital transformation as a catalyst for institutional efficiency, Nigerian universities face barriers to adopting and scaling digital tools for human and material resource management. Moshood et al., (2020) asserts that infrastructural deficits remain the most cited obstacle, including inadequate ICT facilities, unreliable power supply, and poor internet connectivity. Funding constraints also limit universities' ability to procure and maintain the hardware, software, and skilled personnel necessary for digital transformation (TETFund, 2023).

A further challenge as found by Yusuf and Ibrahim (2024) is the digital skills gap among administrative and academic staff, which restricts the effective use of available technologies. And when there is no consistent training and capacity-building, new systems risk being underutilised or mismanaged. In addition, fragmented policies and a lack of coordinated implementation strategies across universities have produced a patchwork of unaligned projects rather than institution-wide transformation. Cultural resistance to change, lack of incentives for innovation, and data security concerns also discourage more ambitious digital initiatives (UNESCO, 2023). These barriers have slowed the pace of digital transformation and limited its impact on sustainable human and material resource management in Nigerian higher education.

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Despite these challenges, the literature reveals significant opportunities for Nigerian universities to harness digital transformation for sustainable resource management. Advances in cloud computing, artificial intelligence, and big data analytics offer tools for real-time monitoring of staff performance, predictive maintenance of physical assets, and data-driven decision-making Global best practices demonstrate how integrated enterprise systems, e-procurement platforms, and digital dashboards can radically improve transparency and accountability in universities (EDUCAUSE, 2023; UNESCO, 2023).

Nigeria's growing investment in ICT infrastructure, the expansion of public-private partnerships, and international funding for digital capacity-building programmes like TETFund ICT interventions which provide a favourable environment for scaling digital initiatives (TETFund, 2023; NUC, 2024). The post-COVID acceleration of online learning and virtual administration has also created a window of opportunity for universities to institutionalise digital practices beyond emergency measures

Methodology

Research Design

A systematic review was employed to investigate and compile relevant information that addresses the research objectives in this study, ensuring responses are grounded in credible findings (Higgins et al., 2022). This approach, which integrates diverse information sources, was chosen to assess the adoption of digital transformation in Nigerian universities, evaluate its impact on efficiency, transparency, and sustainability, identify implementation challenges, and explore future opportunities for leveraging AI and digital technologies in managing human and material resources (Snyder, 2019).

Systematic Review Process

The process for the review of literature for this study consists of five different stages namely: selection of sources, search strategy, selection criteria, identifying themes, and content analysis and synthesis. The process is shown in Figure 1.

Selection of Sources

A thorough search was conducted on some online and reliable academic databases, such as Google Scholar, Elsevier's Scopus, Web of Science, ScienceDirect, and Academia, due to their extensive collections of peer-reviewed journal arti-

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cles, conference papers, and reports. Also, relevant article of interest was search in local academic publications in Nigeria to ensure comprehensive corpus of literature covering both human and material resources management.

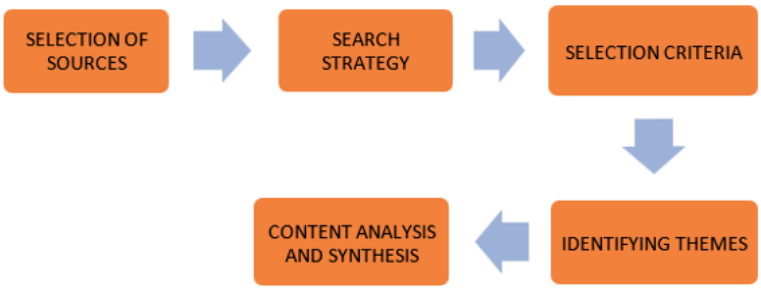

Figure 1. Systematic Review Process

Search Strategy

Terms or keywords from appropriate source material were used to create a search strategy on digital transformation in Nigerian universities from 2015-2025. The databases selected were thoroughly searched using search keywords and Boolean operators (Constance and Opah, 2023). The Keywords and Boolean operators used for the search are as follows;

- ("digital transformation" OR digitalization OR digitization OR "technology adoption") AND (university OR "higher education") AND Nigeria
- ("AI" OR "artificial intelligence" OR "machine learning") AND ("human resource management" OR HRM OR workforce) AND university AND Nigeria
- ("digital procurement" OR e-procurement OR "administrative systems)" AND (material resources OR asset management OR facilities) AND (efficiency OR transparency OR sustainability) AND Nigeria
- ("e-learning platforms" OR digital learning OR online learning) AND (staff training OR human resources OR instructors) AND Nigeria

Criteria for Screening and Selection

Following the initial search, the titles and abstracts of each article were assessed for their applicability to the goal of the study while literature that significantly strayed from the study's primary concerns were disqualified. As indicated in Tables 1 and 2, articles that satisfied the qualifying and disqualifying requirements were chosen for review. Furthermore, after a comprehensive search, the PRISMA process as shown in Figure 2 was used to choose 25 scientific articles.

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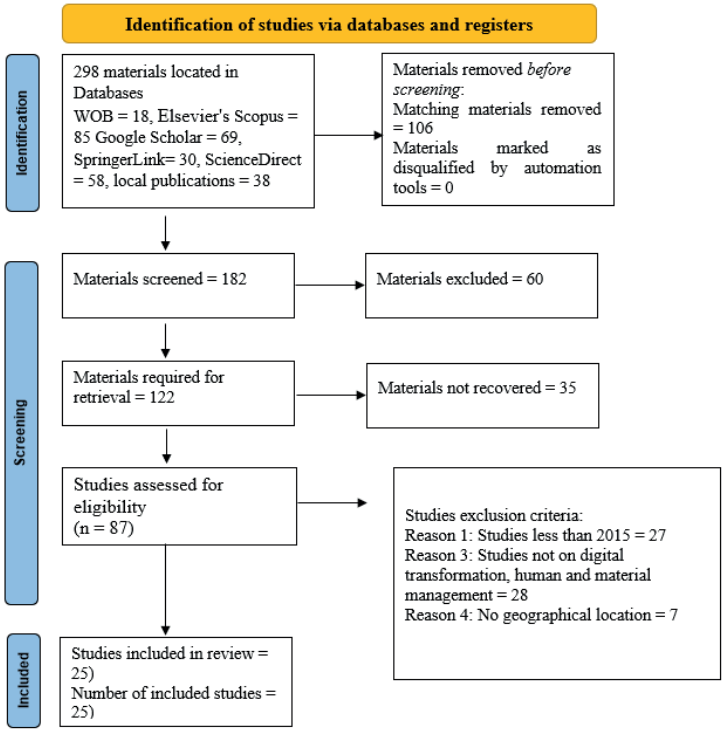
Criteria	Reason for Inclusion
Publication Years	Studies published between 2015 and 2025
Geographical Focus	Studies carried out in Nigeria
Language	Articles published in English
Study Type	Empirical studies (quantitative, qualitative, or mixed methods)
Article Availability and Accessibility	Full-text articles are available and accessible online
Focus	Studies addressing one or more aspects of digital transformation, sustainable human and material resource management in Nigerian universities

Table 1. Inclusion Criteria

Criteria	Reasons for Exclusion
Publication Years	Studies published before year 2015
Geographical Focus	Studies conducted outside Nigeria
Language	Articles not published in English
Study Type	Studies with a purely theoretical or conceptual focus
Article Availability and Accessibility	Full-text articles not available and accessible online
Focus	Studies not related to digital transformation, sustainable human and material resource management in Nigerian universities

Table 2. Exclusion Criteria

Figure 2. Studies PRISMA Flowchart



Data Extraction and Analysis

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Author's name, year of publication, location, study methodology, and main findings were among the information that this study independently collected as part of the data extraction process. A thematic approach was employed to analyse and synthesize the data.

Results and Discussion

Literature Findings

An overview of the 25 empirical studies selected and reviewed among other literature carried out in Nigeria is outlined in Table 3 as follows.

S/N	Author(s)	Year	Location	Methodology	Main Findings
1	Amaechi et al.	2025	South-East States	Descriptive survey design	Major challenges to digital revolution practices: Infrastructural limitations, poor internet connectivity, unequal access to digital devices, staff resistance to innovations
2	Adeoye et al.	2023	Kwara State	Descriptive analysis	Collaboration among government, business, and academia is crucial. Major challenges: infrastructure deficits, lack of teacher training, curriculum gaps, and limited inclusivity.
3	Nwadiani	2025	Edo State	Multi-method empirical study: media analysis + two experimental studies	Perceptions of the relationship between digitalization and sustainability vary by dimension: ecological and economic sustainability perceptions are influenced by digitalization extent, but social sustainability is less affected. Findings highlight the need to consider social sustainability separately. The way actors perceive these links influences their responses and decisions, with practical implications for managers and policymakers.
4	Ajie	2025	Edo State	Descriptive research	AI enhances efficiency, personalization, and relevance of academic libraries. Challenges: poor infrastructure, unstable power supply, lack of expertise, financial uncertainty, and privacy issues. Recommends training staff, promoting innovative AI practices, and ensuring ethical AI adoption to sustain knowledge management.
5	Menyechi	2025	Rivers State	Descriptive	Major constraints: limited technical expertise, inadequate infrastructure, high cost of implementation, data privacy and security issues, staff resistance, limited funding, weak policy frameworks, low awareness, reliance on manual processes, and scarcity of AI-powered HR tools. Recommendations: staff training, infrastructure upgrade, data protection policies, change management, process automation, policy development, collaboration with vendors, and funding exploration.
6	Asabor et al.,	2025	Delta State	Theoretical/proposal-based study	Digital HRM transformation is vital for administrative efficiency, service delivery, and competitiveness in Nigerian universities. Introduces five core dimensions for assessing digital HRM: Recruitment & Selection, Training & Development, Performance Management, Employee Engagement & Communication, HR Administrative Efficiency. Identifies challenges: poor technological infrastructure, staff resistance to digital tools.

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S/N	Author(s)	Year	Location	Methodology	Main Findings
7	Makinde et al.	2025	Lagos State	Descriptive survey design	Digital transformation significantly improves teacher training ($r = 0.68$, $p < 0.05$). Digital transformation significantly enhances student engagement ($r = 0.72$, $p < 0.05$). Concludes that digital tools/initiatives play a major role in strengthening teacher capacity and student participation in Nigerian higher education.
8	Odoh et al.	2024	Enugu State	Cross-sectional survey design	Deployment of digital tools for student records, enrolments, and financial transactions - Existence of centralized data centers with high-capacity servers - Constraints: inadequate digital infrastructure, poor funding for data subscription, and unstable electricity - These challenges affect lecturers' digital readiness for teaching, research, and community service.
9	Afolabi et al.	2024	Osun State	Descriptive survey design	Cloud-based services are widely used for storage and accessibility of digital content. Online access to electronic resources is user-friendly and extensively utilized. Financial constraints hinder full implementation of digital strategies.
10	Ogboe et al.	2024	Nation wide	Survey	AI can streamline recruitment by reducing bias and improving candidate evaluation. AI enables personalized staff development via targeted training. Performance appraisal becomes more effective with real-time, data-driven feedback. Remuneration strategies can be improved by aligning pay with performance and market trends. AI integration leads to improved staff performance, institutional effectiveness, and alignment with educational goals. Implementation challenges exist and require institution-specific adaptation
11	Okwu et al	2024	River State	Descriptive survey design	Digitalization of instructional, administrative, and health facilities significantly enhances student learning outcomes. There were no significant differences between teaching and non-teaching staff perceptions, except for instructional facilities.
12	Adeyemi et al.	2024	Osun State	Descriptive Survey Design	Digital transformation tools and resources significantly enhance students' learning experience and future work preparedness. Management should continually provide modern digital tools and integrate them into curricula. Students should actively use available digital resources for skill enhancement.
13	Iibi et al.	2024	Rivers State	Descriptive analysis	Nigerian universities face significant obstacles in digitization due to poor internet connectivity, high data costs, power instability, and limited institutional capacity. Despite challenges, digital transformation offers vast opportunities for enhancing curriculum delivery, administrative efficiency, and information management. Successful digitization requires strategic collaboration between government, policymakers, and institutions.
14	Nweke	2025	Enugu State	Descriptive survey design	Digital administrative systems significantly enhance collaboration, communication, and transparency within university management. The system fosters a more accountable and participatory organizational culture. Effective training and change management strategies are critical for overcoming staff resistance and promoting digital adoption.

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S/N	Author(s)	Year	Location	Methodology	Main Findings
15	Uzor et al.	2023	Anambra State	Ex-post-facto research design	Inadequate ICT infrastructure negatively affects HRM in Nigerian universities. Poor ICT application limits HR performance and administrative efficiency. ICT has a significant relationship with HRM effectiveness in university systems.
16	Nwachukwu et al.	2024	Imo State	literature-based overview	AI integration enhances administrative processes and student support. Big data analytics improves evidence-based management decisions and resource allocation. Lean management boosts operational efficiency and reduces waste. Digital transformation tools (cloud computing, online platforms) expand accessibility and collaboration. Stakeholder collaboration and continuous leadership development foster sustainable institutional management
17	Aleru et al.	2024	Rivers State	Descriptive Survey Research	There is an increasing adoption of digital tools in personnel management (e.g., for recruitment, evaluation, and training). Digitalization enhances productivity but faces challenges due to inadequate infrastructure, training gaps, and organizational resistance. Successful integration depends on effective change management, training, and institutional support.
S/N	**Author(s)**	**Year**	**Location**	**Methodology**	**Main Findings**
18	Ejo-Orusa et al.	2018	Rivers State	Cross-sectional survey design	Predictive HR Analytics (PHRA) has a significant positive relationship with HRM practices such as recruitment, performance management, and succession planning. PHRA helps improve efficiency and effectiveness in HR processes through data-based insights. Most HR practitioners in Port Harcourt only use descriptive analytics and have limited capability in predictive metrics application.
19	Echu et al.	2021	North Central Zone	Exploratory quantitative research desig	The pandemic accelerated digital technology adoption in university management and teaching. Academics faced challenges such as inadequate infrastructure, limited digital skills, student unpreparedness, low motivation, and stress-related health issues. Despite challenges, technology improved remote engagement and continuity of learning. University management should institutionalize effective remote learning innovations and integrate them into post-pandemic education strategies. Emphasis on capacity building, digital literacy training, and investment in ICT infrastructure for sustainable higher education management
20	Olafimihan et al.	2024	South-West Zone	Descriptive Survey Research	Emerging technologies, particularly AI, are transforming library operations and access to information. Positive impacts: enhanced user experience, improved resource discovery, and greater accessibility. Challenges: data privacy risks, need for staff training, and infrastructural inadequacies. It recommends strategic implementation, capacity building, and ethical guidelines for technology adoption in libraries.
21	Ogochukwu	2023	Delta State	Descriptive Survey Research	Low adoption of AI technologies in university libraries. Security scanning devices are the most commonly used AI tools. Advanced AI tools such as chatbots, robots, RFID, and face recognition are largely absent. Librarians are aware of AI's potential, but barriers such as lack of training, unreliable power supply, and insufficient infrastructure hinder adoption.

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S/N	Author(s)	Year	Location	Methodology	Main Findings
22	Ezeugwu	2025	Nation wide	Quantitative survey design	Digital transformation significantly enhances sustainable development in HEIs. Organizational culture plays a moderating role, strengthening the positive impact of digital transformation on sustainability outcomes. Key challenges include inadequate infrastructure, low digital literacy, and resistance to change. Institutions with supportive and adaptive cultures achieve better sustainability through technology-driven practices.
23	Aregbesola et al.	2025	Nation wide	Quantitative research design	Digital transformation significantly influences science educators' knowledge acquisition and instructional practices. Educators reported increased confidence and engagement in using digital tools for teaching. Use of digital tools (e.g., online courses, interactive platforms) enhances student engagement and dynamic learning environments. Continuous professional development and institutional support are critical for effective integration of technology in teaching
24	Ojelade et al.	2022	FCT	Survey research design	Online platforms have transformed teaching and learning but require improved efficiency and digital readiness. Both lecturers and students need greater support and training to enhance online engagement. The effectiveness of online teaching is hindered by infrastructural and digital literacy challenges. Stakeholder involvement is critical to improving online learning systems.
25	Elenwo et al.	2025	Rivers State	Qualitative case study	The integration of AI in HRM is still minimal in Nigerian higher institutions. Technical and infrastructural deficiencies are key barriers. Resistance to change and lack of AI awareness hinder adoption. Strategic interventions (training, policy reform, infrastructure investment) are essential for effective integration.

The reviewed of the selected studies display some variations as shown in Table 3, reflecting different years, diverse locations, methodologies and main findings. The studies selected cut across the six-geopolitical zones in Nigeria, which represent a broad representation of different cultural background in Nigeria and digital transformation contexts (see Figure 3). Furthermore, studies published in year 2025 and 2024 had the highest frequency of 10 and 9 respectively, while there no selected publication between year 2015 and 2017 as shown in Figure 4

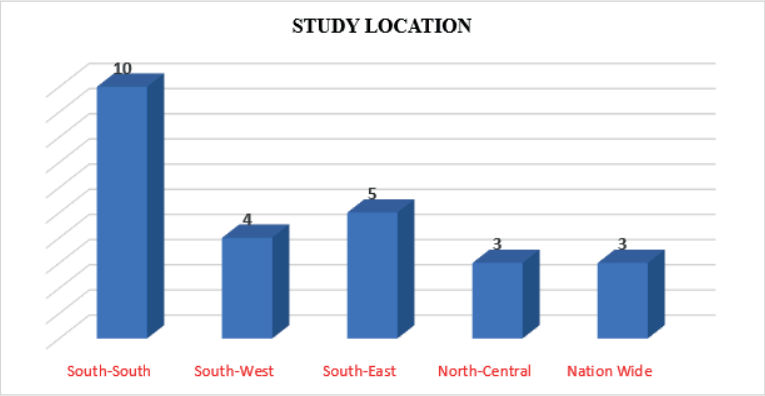

Figure 5. Number of Studies Based on Geo-political Zones in Nigeria

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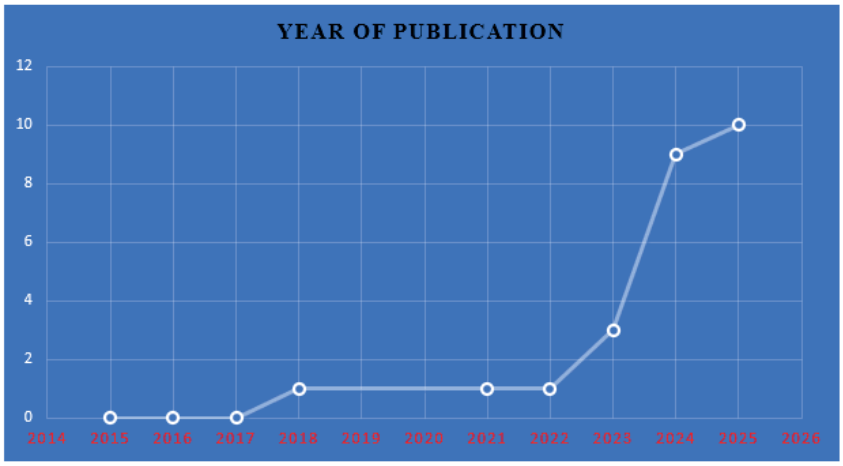

Figure 4. Number of Studies Based on Year of Publication

Research Question One: To what extent have Nigerian universities adopted digital transformation initiatives for managing human and material resources?

The extent of digital transformation adoption in Nigerian universities can be described as moderate or at intermediate stage, with notable advancements in administration, teaching, learning, and library services, but there still remain significant challenges such as lack of infrastructural, technical, and institutional factors. For example, Ezeugwu (2025) reported that digital transformation significantly enhances sustainability outcomes in higher education institutions, particularly where supportive organizational cultures exist. Similarly, Aregbesola et al. (2025) found that the adoption of digital tools among science educators nationwide has improved instructional practices and increased student engagement, highlighting growing institutional interest in digital education systems. Studies by Olafimihan et al. (2024) and Adeyemi et al. (2024) show that emerging technologies, particularly AI, are transforming library operations and enhancing student learning experiences. In the South-East and South-South regions, research by Amaechi et al. (2025), Nwadiani (2025), and Asabor et al. (2025) demonstrates partial digital integration in HR and administrative functions, though progress is slowed by infrastructural limitations, staff resistance, and insufficient funding. Similarly, Menyechi (2025) and Elenwo (2025) confirmed that AI adoption in human resource management remains low due to inadequate infrastructure, lack of expertise, and weak policy frameworks. Moreso, Echu et al. (2021) observed that the COVID-19 pandemic sped up the shift to digital methods in education and management, albeit hindered by low digital literacy and infrastructure issues. Ojelade et al. (2022) noted the transformative potential of online platforms

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in the Federal Capital Territory but called for better digital readiness among teachers and students. Furthermore, ongoing challenges such as unreliable power supply, poor internet access, insufficient ICT infrastructure, and lack of staff training, as highlighted by Amaechi et al. (2025), Odoh et al. (2024), and Iibi et al. (2024), continue to prevent full technological integration.

Research Question Two: How do digital tools such as AI-driven administrative systems, e-learning platforms, and digital procurement influence efficiency, transparency, and sustainability in university resource management?

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