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Review Article

Exploring digital transformation and future trends in higher education development across African nations

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This systematic literature review investigates the digital transformation landscape in higher education across African nations, focusing on current trends and prospects. As digital technologies continue to reshape educational practices globally, the study employs diffusion of innovation as a theoretical framework to understand the impact of digital transformation on the development of higher education in African contexts. Through a comprehensive analysis of existing research, this study synthesises critical findings regarding the adoption, implementation, and outcomes of digital transformation initiatives in African higher education institutions. The review explores various dimensions, including technological infrastructure, pedagogical approaches, student engagement, faculty development, and institutional strategies. Additionally, it identifies challenges and opportunities associated with digital transformation efforts and highlights implications for policy, practice, and research in the African higher education sector. By synthesising insights from diverse scholarly works, this review offers valuable perspectives for stakeholders aiming to navigate the complexities of digital transformation in higher education within African contexts.

Keywords: Digital transformation, higher education, technology adoption, pedagogical approaches, student engagement, institutional strategies, challenges

1. Introduction

Digital transformation has emerged as a transformative force reshaping various sectors, including higher education, across the globe (Ajani & Maphalala, 2023). Integrating digital technologies into educational practices has led to significant shifts in teaching and learning methodologies, institutional operations, and student engagement. In African nations, where educational systems face unique challenges and opportunities, understanding the digital transformation landscape in higher education is crucial for advancing educational outcomes and fostering socio-economic development (Adeniyi et al., 2024). Despite the increasing recognition of the importance of digital transformation in higher education, the adoption and implementation of digital technologies vary significantly across African nations. Infrastructure limitations, resource constraints, and contextual differences pose opportunities and challenges for digital integration in higher education institutions (Afolabi & Ajani, 2023; Wende, 2001). Therefore, a comprehensive examination of the current trends and prospects of digital transformation in African higher education is warranted.

One theoretical lens through which to analyse digital transformation in higher education is the diffusion of innovation theory (Rogers, 2003). This theory provides a framework for understanding organisations adopting and assimilating new technologies. Applying this theoretical perspective to African contexts allows for a nuanced exploration of the factors influencing the adoption and diffusion of digital innovations in higher education institutions (Alabi & Braimoh, 2020). The implications of digital transformation in higher education extend beyond technological advancements to encompass pedagogical approaches, student learning experiences, and institutional strategies. In African nations, where educational systems grapple with issues of accessibility, quality, and relevance, the integration of digital technologies holds the potential to

address these challenges and improve educational outcomes. However, realising this potential requires a comprehensive understanding of the complexities involved in digital transformation initiatives.

Moreover, the digital divide between developed and developing nations exacerbates existing inequalities in access to quality education (Ajani & Gamede, 2021). Bridging this divide necessitates targeted interventions and innovative approaches to digital integration in higher education, particularly in African contexts where disparities in technological infrastructure and digital literacy persist (Maphalala et al., 2021). Research on digital transformation in higher education has predominantly focused on Western contexts, overlooking African nations' unique challenges and opportunities. Therefore, there is a need for empirical studies that centre on African perspectives and experiences to inform policy, practice, and research agendas in the global discourse on digital transformation in higher education.

This study seeks to address this gap by conducting a systematic literature review of digital transformation in higher education across African nations. This review aims to provide insights into the current trends, challenges, and opportunities of digital integration in African higher education institutions by synthesising existing scholarship from African contexts to global perspectives. Through a comparative analysis of digital transformation initiatives, this study aims to contribute to a deeper understanding of the complexities involved in fostering digital innovation in diverse educational settings.

2. The Emergence of Online Learning in Higher Education

Online learning, also known as e-learning, has experienced exponential growth in recent years, driven by advancements in digital technologies and the increasing demand for flexible and accessible education (Maphalala & Ajani, 2024). This evolution of online learning presents opportunities and challenges for educational institutions worldwide, including those in African nations. Understanding the trajectory of online learning, from its inception to its current state, is essential for navigating the complexities of digital education and harnessing its potential for enhancing learning outcomes (Ajani & Khumalo, 2023; Guri-Rosenblit, 2005). Online learning traces its roots back to the early days of the Internet, with the development of computer-mediated communication tools and the establishment of virtual learning environments. In many African nations, the adoption of online learning gained momentum in the late 20th Century, driven by efforts to expand access to education and address the challenges of traditional brick-and-mortar institutions (Bozkurt et al., 2017).

One of the primary opportunities online learning offers is its potential to overcome barriers to access and promote inclusivity in education (Al-Azawei et al., 2017). Thus, in African nations, where geographical distances, limited infrastructure, and socio-economic disparities pose significant obstacles to education, online learning offers a pathway to reach learners in remote areas and marginalised communities (Allen & Seaman, 2017). Furthermore, online learning platforms allow learners to engage in education at their own pace, location and convenience, catering to diverse learning styles and preferences (Altbach & de Wit, 2017; Bates, 2019). This personalised approach to learning is particularly beneficial in African contexts, where traditional education systems may struggle to accommodate the needs of individual learners and provide equitable access to educational resources (Altbach & de Wit, 2019; Anderson, 2008).

In addition, advancements in technology, such as mobile devices and high-speed internet connectivity, have further facilitated the growth of online learning and expanded its reach to even the most remote areas (UNESCO, 2020). Hence, in African nations, where mobile penetration rates continue to rise rapidly, mobile learning platforms offer a promising avenue for delivering educational content to learners across diverse contexts. However, despite the opportunities presented by online learning, ensuring the quality and credibility of online education remains a pressing challenge (Garrison & Vaughan, 2018). Moreso, in African nations, where regulatory frameworks for online learning are still evolving, accreditation, certification, and quality assurance

issues pose significant hurdles to the widespread adoption of online education (Aruleba & Jere, 2022).

Furthermore, the digital divide, characterised by disparities in access to digital technologies and internet connectivity, remains a significant barrier to online learning in African nations (Bates & Sangra, 2011). While urban areas may have relatively better access to digital infrastructure, rural and underserved communities often lack the necessary resources to participate fully in online education initiatives. The transition to online learning requires a fundamental shift in pedagogical approaches and necessitates comprehensive training for educators to effectively facilitate online courses (Bates, 2019). Hence, in African nations, where teaching capacities may vary and digital literacy among educators is uneven, investing in teacher training and professional development is essential to ensure the successful implementation of online learning initiatives (Bozkurt et al., 2017).

Further evidence asserts that online learning platforms must accommodate diverse cultural and linguistic contexts to ensure educational content is accessible and relevant to all learners (Bates, 2019; Brown, 2015). In many African nations, where multiple languages and cultural traditions coexist, designing inclusive online learning experiences that resonate with learners' cultural identities and backgrounds is imperative for fostering meaningful engagement and learning outcomes (Bozkurt et al., 2017). Thus, sustaining online learning initiatives requires significant financial investments in infrastructure, technology, and human resources (Bates, 2019). Unlike most African nations, where financial resources may be limited and competing priorities abound, identifying sustainable funding models and securing long-term support for online education programmes pose considerable challenges.

However, despite the challenges inherent in the evolution of online learning, the potential benefits of digital education for African nations are immense (Christensen et al., 2013). By leveraging technological innovations, fostering collaboration among stakeholders, and prioritising equity and inclusivity, African nations can harness the transformative power of online learning to advance educational access, enhance learning outcomes, and drive socio-economic development in the 21st Century. Conversely, the emergence of the COVID-19 pandemic that rocked the global world from 2019-2021 advanced the cause for and the significance of learning technologies in the education system (Ajani & Khumalo, 2023). The pandemic forced higher education institutions in many parts of Africa to embrace various online learning platforms. Technology is no longer an innovation in most developed countries; it has yet to be widely adopted in many African universities (Bates, 2019). Thus, adopting and using technology became a widely accepted innovation in the African education system. Hence, the following section explains the diffusion of innovation theory as a theoretical lens to understand digital transformation in African higher education spaces.

3. Theoretical Framework

This study adopts diffusion of innovation theory as a theoretical lens to establish the impact of digital transformation in higher education. The diffusion of innovation theory, proposed by Everett Rogers in 1962, provides a comprehensive framework for understanding the process by which new ideas, technologies, and practices spread and are adopted within a social system (Rogers, 2003). This theoretical perspective has gained significant traction in the study of digital transformation in higher education, offering insights into the factors influencing the adoption, implementation, and outcomes of technological innovations (Altbach & de Wit, 2019). This explains why some institutions face various influencing factors in digital transformation, from one institution to another and from one country to another in Africa. Thus, by examining the interplay between innovation attributes, communication channels, social networks, and adopter characteristics, the diffusion of innovation theory provides a nuanced understanding of how digital technologies permeate educational settings and shape institutional practices (Selwyn, 2016).

The diffusion of innovation theory, first put forward by Everett Rogers in 1962, is a solid basis for this theoretical framework because it gives a detailed picture of how technological innovations

are adopted and used in different settings, such as higher education in Africa (Rogers, 2003). According to the theory, individuals within a social system go through distinct stages of awareness, interest, evaluation, trial, and adoption before adopting innovations (Rogers, 2003). Thus, in the context of African higher education, the diffusion of innovation theory offers insights into the patterns and dynamics of technology adoption among students, faculty, administrators, and other stakeholders (Rogers, 2003). By examining the characteristics of innovators, early adopters, early majority, late majority, and laggards within the academic community, researchers can identify factors that facilitate or impede the uptake of digital technologies in educational settings.

According to Rogers (2003), innovations are perceived and evaluated based on their relative advantage, compatibility, complexity, trialability, and observability. This is why, in the realm of higher education in many parts of Africa, digital transformation initiatives must demonstrate clear advantages over traditional methods, align with existing pedagogical practices and institutional norms, offer user-friendly interfaces, provide opportunities for experimentation, and yield visible outcomes to gain acceptance and adoption (Bozkurt et al., 2017). The diffusion of innovation theory highlights the role of communication channels in disseminating information, shaping perceptions, and facilitating the spread of innovations within social systems (Rogers, 2003). Various higher education institutions in Africa embark on effective communication strategies, such as faculty workshops, peer networks, online forums, and promotional campaigns, which play a crucial role in raising awareness, generating interest, and building support for digital transformation initiatives (Maphalala et al., 2021).

Therefore, assessing social networks and their influence shows how digital transformation has been embraced. Social networks and interpersonal relationships significantly influence individuals' adoption decisions within academic communities (Rogers, 2003). In higher education, opinion leaders, mentors, and peer influencers are pivotal in championing innovation, sharing best practices, and shaping the norms and culture surrounding technology use. However, the transformation comes with resistance and barriers (Khoalenyane & Ajani, 2023). The diffusion of innovation theory also sheds light on the factors contributing to resistance and barriers to adoption within organisations (Rogers, 2003). In higher education, concerns related to technological readiness, institutional inertia, lack of support, training deficiencies, and fear of change can impede the successful implementation of digital transformation initiatives (Bozkurt et al., 2017).

Furthermore, examining the innovation-decision process reveals some critical stages in digital transformation. As Rogers (2003) conceptualised, the innovation-decision process comprises five stages: knowledge, persuasion, decision, implementation, and confirmation. In the context of higher education, this framework helps researchers and practitioners understand how individuals and institutions navigate the complexities of adopting and institutionalising digital innovations, from initial awareness to sustained utilisation (Daniel, 2012). Analysing diffusion networks further clarifies the theory. The diffusion of innovation theory emphasises the importance of analysing diffusion networks—the pathways through which innovations spread within social systems (Rogers, 2003). Studying the interactions and exchanges among stakeholders, including students, faculty, administrators, policymakers, and external partners in higher education, provides valuable insights into digital transformation initiatives diffusion dynamics and scalability (Bozkurt et al., 2017). According to Maphalala and Ajani (2024), exploring contextual factors in adopting and using digital technologies in education provides opportunities, challenges and prospects for higher education. These contextual factors, such as institutional culture, leadership dynamics, resource availability, and policy environments, shape the diffusion and adoption of innovations in higher education (Rogers, 2003). By considering these contextual influences, researchers can tailor digital transformation strategies to align with diverse educational settings' unique needs, priorities, and constraints.

Hence, the diffusion of innovation theory offers practical guidance for designing and implementing effective strategies to promote the uptake of digital technologies in higher education (Rogers, 2003). Institutions can accelerate the pace and scale of digital transformation initiatives by

emphasising the importance of targeting early adopters, fostering supportive environments, providing incentives for experimentation, and facilitating peer learning and collaboration (Bozkurt et al., 2017). In the digital transformation of higher education in African countries, the diffusion of innovation theory is a valuable theoretical lens for understanding the complexities of digital transformation in higher education. By examining adoption patterns, innovation attributes, communication channels, social networks, resistance factors, decision processes, diffusion networks, contextual factors, and implementation strategies, researchers and practitioners can develop evidence-based approaches to drive sustainable change and innovation in educational practice.

4. Method

4.1. Research Design and Data Collection

This study adopted a systematic literature review approach. Hence, a rigorous methodology was employed to identify, select, and analyse relevant scholarly works on the digital transformation landscape in higher education across African nations. The process began with a comprehensive search of electronic databases of Google Scholar and Scopus, using relevant keywords such as "digital transformation," "higher education," and "Africa" to search for appropriate publications (Flick, 2018; Silverman, 2016). The initial search of materials on the phenomenon led to 821 publications, which were further screened to only publications published in English, peer-reviewed and related to higher education for the inclusivity of relevant literature. The search was drawn from the databases of Google Scholar and Scopus, mainly for articles from 2000 to 2024. Additionally, hand-searching of key journals and reference lists of identified articles was conducted to supplement electronic searches and minimise the risk of overlooking pertinent studies.

4.2. Data Analysis

Following the initial search phase, a systematic screening process was implemented to identify studies that met pre-defined inclusion criteria. These criteria encompassed relevance to the research topic, publication in peer-reviewed journals or academic books, and availability of full-text articles in English. Two reviewers screened titles and abstracts of retrieved records independently to assess their eligibility for inclusion in the review (Creswell, 2013). Any reviewer discrepancies were resolved through discussion or consultation with a third reviewer to ensure consistency and accuracy in study selection.

Subsequently, selected studies underwent a thorough quality assessment to evaluate their methodological rigour and validity (Green & Thorogood, 2018). Quality appraisal criteria were adapted from established guidelines, using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses [PRISMA] checklist and the Critical Appraisal Skills Programme [CASP] tool for qualitative studies (Denzin & Lincoln, 2018). Each included study was critically appraised based on criteria relevant to its study design, research methods, data analysis, and reporting quality. Studies deemed to have methodological limitations or biases were not excluded (Patton, 2014) but were considered in synthesising findings and interpreting results with appropriate caveats (Guest et al., 2006). Thus, 39 publications were finally selected and systematically reviewed to present in-depth information for this study. The systematic literature review employed for this study used content data analysis to analyse various appropriate literature sources. Braun and Clarke (2006) described the analysis through systematic procedural steps. Thus, the generated themes present the following findings.Top of Form

5. Findings

The findings of this systematic literature review reveal several critical themes regarding the digital transformation landscape in higher education across African nations. Under the sub-heading "Technological Infrastructure," it was evident that while significant progress has been made in

expanding access to digital technologies in African higher education institutions, there are disparities in infrastructure quality and connectivity (Gamede et al., 2022). Many universities need help with adequate internet bandwidth, outdated hardware, and insufficient technical support, hindering the effective integration of digital tools into teaching and learning (Czemiewicz, 2018). Thematic analysis of the reviewed publications resulted in the themes in Table 1.

Table 1
Focused themes

Themes	*Digital transformation landscapes*
Theme 1	Adoption Trends
Theme 2	Implementation Challenges
Theme 3	Pedagogical Innovations
Theme 4	Technological Infrastructure
Theme 5	Faculty Development
Theme 6	Student Engagement
Theme 7	Institutional Strategies
Theme 8	Prospects and Future Trends of Digital Transformation in Higher Education

5.1. Theme One: Adoption Trends

One prominent finding from the review is the varying adoption rates of digital technology among higher education institutions in African nations. While some institutions have embraced digital transformation initiatives to enhance teaching and learning, others have encountered barriers related to limited resources, infrastructure, and expertise (Daniel., 2012; Mhlanga et al., 2022). Adoption factors include institutional leadership, funding availability, and faculty readiness to integrate technology into their pedagogical practices (Daniels & Gebhardt, 2021; Gamede et al., 2022). Moreover, the review identifies a growing trend towards the adoption of learning management systems [LMS] and virtual learning environments [VLEs] to facilitate remote learning, particularly in response to the COVID-19 pandemic. Furthermore, the findings of this systematic literature review reveal several adoption trends regarding digital transformation in higher education across African nations. One prominent trend identified is the increasing adoption of digital technologies and online learning platforms to expand access to education and reach diverse student populations (Garrison et al., 2001). Institutions are leveraging digital tools such as learning management systems, multimedia resources, and mobile applications to deliver flexible and interactive learning experiences that accommodate the needs and preferences of students from various backgrounds and locations (Guri-Rosenblit, 2005). This trend aligns with the global shift towards online and hybrid learning models, driven by technological advancements and the growing demand for lifelong learning opportunities in the digital age (Daniel, 2012).

Moreover, the literature highlights a growing emphasis on integrating digital literacy and 21st-century skills into curricular and co-curricular activities as part of the adoption trend in higher education institutions across African nations (UNESCO, 2020). Institutions recognise the importance of equipping students with the knowledge, skills, and competencies needed to thrive in a digitally-driven society and economy. This involves redesigning courses and programmes to incorporate digital tools and resources, providing training and support for faculty to enhance their digital teaching competencies, and implementing initiatives to promote digital citizenship and responsible use of technology among students (Altbach & De Wit, 2017; Itasanmi et al., 2022). By embracing these adoption trends, higher education institutions in African nations can better prepare students for the challenges and opportunities of the digital future and contribute to socio-economic development and global competitiveness.

5.2. Theme Two: Implementation Challenges

Despite the potential benefits of digital transformation, the review highlights various challenges associated with its implementation in African higher education contexts. These challenges include inadequate infrastructure, limited internet connectivity, and insufficient technical support for

faculty and students (Janssen et al., 2013). Additionally, issues such as digital literacy gaps among faculty and students, resistance to change, and concerns about the quality of online education have hindered the effective implementation of digital initiatives (Maphalala & Ajani, 2024). The implementation challenges identified in this systematic literature review underscore the multifaceted nature of digital transformation in higher education across African nations (Keegan, 2013). One significant challenge highlighted in the literature is the persistent issue of inadequate technological infrastructure, which impedes the effective integration of digital technologies into teaching and learning processes. Limited access to reliable internet connectivity, outdated hardware and software, and insufficient technical support for faculty and students are among the key barriers faced by higher education institutions in Africa (Keengwe & Georgina, 2014). These infrastructure deficiencies hinder online education delivery and exacerbate disparities in access to quality educational resources, particularly for students in rural or underserved areas (Khoalenyane & Ajani, 2023).

Another critical implementation challenge identified in the review is the digital literacy gap among faculty and students, which poses barriers to successfully adopting digital technologies in higher education settings (Maphalala et al., 2021). Many educators need more skills and knowledge to effectively leverage technology for teaching and learning purposes, resulting in resistance to change and reluctance to embrace innovative pedagogical approaches (Gamede et al., 2022; Lentz & Bork, 2016). Similarly, students may need more support and guidance to navigate digital learning environments, engage with online course materials, and participate in collaborative activities. Addressing these digital literacy challenges requires targeted interventions, including professional development programs for faculty, student skills training, and ongoing technical assistance to ensure the successful implementation of digital transformation initiatives in African higher education institutions (Farias-Gaytan et al., 2023; Langseth et al., 2023).

5.3. Theme Three: Pedagogical Innovations

The review also underscores the emergence of pedagogical innovations driven by digital transformation in African higher education. These innovations include adopting flipped classroom models, active learning strategies, and competency-based approaches to instruction (Levy, 1999). Digital technologies have enabled more interactive and student-centred learning experiences, facilitating personalised learning pathways and promoting higher-order thinking skills among students (Fullan, 2001). The pedagogical approaches that came with the diffusion of innovation identified a shift towards student-centred and experiential learning models facilitated by digital technologies (Lubinga et al., 2023). Blended learning, flipped classrooms, and virtual simulations emerged as popular approaches to engage students actively and enhance their learning experiences. However, concerns were raised about faculty training and support to effectively implement these pedagogical innovations and maximise their benefits.

Pedagogical innovations within African higher education institutions have emerged as a critical focus area in the discourse on digital transformation (Magdy & Abouelamz, 2024). Scholars emphasise the need to align pedagogical approaches with the affordances of digital technologies to enhance student engagement, promote active learning, and foster critical thinking skills. The literature highlights various innovative pedagogical practices being adopted across the continent, including flipped classrooms, blended learning models, and inquiry-based learning approaches. These approaches leverage digital tools and resources to create interactive learning experiences that cater to diverse learning styles and preferences, enhancing the overall quality of education (Ajani & Khumalo, 2023). Furthermore, Massive Open Online Courses [MOOCs9 and virtual labs offer opportunities for scaling education delivery and reaching underserved populations, particularly in remote areas (Fullan, 2016).

However, challenges persist in effectively integrating pedagogical innovations into higher education curricula in African contexts. Limited faculty capacity, training, and resistance to change hinder the widespread adoption of innovative teaching methods (Mangundu, 2024). Moreover, concerns regarding digital literacy among students and educators and the digital divide in access

to technology and internet connectivity pose significant barriers to realising the full potential of pedagogical innovations (Fullan, 2001). Nonetheless, efforts to address these challenges are underway, with institutions investing in faculty development programmes, digital literacy initiatives, and educational technology support services to promote the effective implementation of pedagogical innovations (Fullan & Langworthy, 2013). Fostering a culture of innovation and collaboration among stakeholders, coupled with strategic investments in infrastructure and capacity building, will be essential for advancing pedagogical innovation and harnessing the transformative power of digital technologies in African higher education.

5.4. Theme Four: Technological Infrastructure

A critical aspect of digital transformation in higher education is the development of robust technological infrastructure to support teaching, learning, and research activities (Maphalala & Ajani, 2023). The review reveals disparities in infrastructure development across African nations, with urban institutions generally having better access to technology than their rural counterparts. Investments in broadband connectivity, digital devices, and software applications are essential to address infrastructure challenges and ensure equitable access to educational resources. Furthermore, with technological infrastructure, it was evident that while significant progress has been made in expanding access to digital technologies in African higher education institutions, there are disparities in infrastructure quality and connectivity (Gamede et al., 2022; Garrison, 2011). Many universities need help with adequate internet bandwidth, outdated hardware, and insufficient technical support, hindering the effective integration of digital tools into teaching and learning.

Examining technological infrastructures within higher education institutions across African nations unveils various challenges and advancements (Guri-Rosenblit, 2005; Maphalala & Ajani, 2024). While digital transformation endeavours have led to significant progress in enhancing technological infrastructures, considerable disparities persist, particularly in access and quality (Wachira et al., 2019). The literature underscores the critical importance of robust technological infrastructures in supporting various teaching, learning, and research aspects, including online course delivery, collaborative projects, and administrative functions (Bates, 2019; Hakansson Lindqvist et al., 2024). However, inadequate funding, outdated equipment, unreliable internet connectivity, and insufficient technical support often impede the effective utilisation of digital technologies in educational contexts (Altbach & De Wit, 2017; Hall et al., 1975).

Moreover, the literature reveals the emergence of innovative solutions to address the challenges associated with technological infrastructures in African higher education (Hall et al., 1975; Mbarika & Mbarika, 2006; Mense et al., 2018). Collaborative initiatives involving governments, educational institutions, and private sector partners have been instrumental in expanding access to digital resources, upgrading infrastructure, and enhancing connectivity (UNESCO, 2020). For instance, projects focusing on building high-speed internet networks, establishing digital libraries, and providing affordable devices have contributed to bridging the digital divide and creating more inclusive learning environments. Additionally, adopting cloud-based services, mobile learning platforms, and open educational resources has facilitated greater flexibility, scalability, and affordability in delivering educational content and services (Wachira et al., 2019). However, sustainability remains a key concern, necessitating ongoing investment, collaboration, and strategic planning to ensure the long-term viability of technological infrastructures in supporting digital transformation efforts in African higher education (Hill, 2013; Mhlanga et al., 2022).

5.5. Theme Five: Faculty Development

Another key finding is the importance of faculty development programs to support educators in integrating digital technologies effectively into their teaching practices (Hodges et al., 2020; Marshall & Rossman, 2014). The review identifies a need for professional development initiatives to enhance digital literacy, instructional design skills, and online pedagogy. Moreover, fostering a

culture of innovation and collaboration among faculty members is crucial for promoting sustainable digital transformation in higher education institutions.

This systematic literature review's findings underscore faculty development's crucial role in driving digital transformation initiatives in higher education across African nations (Hodgkinson-Williams & Trotter, 2018; Miles et al., 2013). Faculty development programmes have emerged as a critical strategy for equipping educators with the pedagogical and technical skills needed to effectively integrate digital technologies into teaching and learning practices. The literature reveals a growing recognition among institutions of the importance of investing in professional development opportunities that support faculty in navigating the complexities of digital transformation and leveraging technology to enhance student engagement and learning outcomes (Bates, 2019). These programmes often encompass workshops, training sessions, online courses, and communities of practice focused on digital pedagogy, instructional design, online assessment, and technology integration (Mishra & Koehler, 2006; Moshtari & Safarpour, 2024; Picciano & Seaman, 2009).

Furthermore, the literature highlights the need for institutional support and resources to facilitate faculty development efforts effectively (Moore, 1989; Nwosu et al., 2023). Higher education institutions in African nations are increasingly establishing dedicated centres for teaching and learning, instructional design teams, and technology-enhanced learning units to provide ongoing support and guidance to faculty (Altbach & De Wit, 2017; Ojo & Rodriques, 2017). These centres offer faculty expertise, resources, and infrastructure to explore innovative teaching methods, experiment with emerging technologies, and collaborate with colleagues to share best practices (Bates, 2019). However, challenges such as limited funding, inadequate infrastructure, and resistance to change can hinder the effectiveness of faculty development initiatives. Addressing these challenges requires a holistic approach that involves aligning faculty development efforts with institutional goals, fostering a culture of innovation and continuous improvement, and ensuring ongoing evaluation and adaptation of support mechanisms to meet the evolving needs of faculty in the digital age.

5.6. Theme Six: Student Engagement

Findings revealed the impact of digital transformation on student engagement and learning outcomes in African higher education. While digital technologies offer opportunities for increased access to educational resources and interactive learning experiences, they also present challenges related to digital distraction, academic integrity, and social isolation. Strategies to promote student engagement include multimedia content, collaborative learning platforms, and gamification techniques to enhance motivation and participation. "Various scholars assert that student engagement indicated that digital transformation initiatives have the potential to enhance student engagement and participation in higher education (Ajani & Khumalo, 2023). Online discussion forums, collaborative projects, and interactive multimedia content were found to promote more profound learning experiences and foster a sense of community among students. Nevertheless, issues such as the digital divide, digital literacy gaps, and socio-economic disparities among students pose significant challenges to equitable access and participation in online learning environments.

5.7. Theme Seven: Institutional Strategies

Institutional strategies emerge as a pivotal factor influencing the successful implementation of digital transformation in higher education across African nations, as evidenced by the findings of this systematic literature review. A critical institutional strategy identified in the literature is the development of comprehensive digital transformation policies and frameworks that provide guidance and direction for integrating technology into various aspects of teaching, learning, and administration. These policies outline clear objectives, priorities, and timelines for digital initiatives, fostering a conducive environment for innovation and change within higher education institutions (Sharma, 2018). Moreover, effective policy formulation involves stakeholder

engagement, collaboration with external partners, and regular monitoring and evaluation to ensure alignment with institutional goals and objectives.

Furthermore, the literature highlights the importance of fostering a culture of innovation and digital readiness within higher education institutions as a critical institutional strategy for advancing digital transformation (Stavredes, 2011). Institutions prioritising innovation cultivate an environment where experimentation, risk-taking, and continuous improvement are encouraged and supported (Braun & Clarke, 2006). This involves investing in faculty development programmes, establishing innovation hubs or centres of excellence, and incentivising faculty to adopt and integrate digital technologies into their teaching practices. Additionally, fostering partnerships with industry stakeholders, government agencies, and non-profit organisations can provide valuable resources, expertise, and funding to support digital transformation initiatives and drive institutional change. By adopting proactive institutional strategies, higher education institutions in African nations can navigate the complexities of digital transformation and position themselves as leaders in the evolving global education landscape (Nwosu et al., 2023).

5.8. Theme Eight: Prospects and Future Trends of Digital Transformation in Higher Education

Exploring prospects and future trends in digital transformation within African higher education illuminates a trajectory characterised by optimism and complexity. As technological advancements continue to accelerate and permeate various facets of society, there is growing anticipation regarding the potential transformative impact on African higher education. The literature suggests that integrating emerging technologies such as artificial intelligence, big data analytics, and virtual reality holds promise for enhancing teaching and learning experiences, promoting innovation, and addressing societal challenges. Furthermore, the COVID-19 pandemic has accelerated the adoption of digital technologies in education, highlighting the imperative for institutions to embrace digital transformation to ensure resilience and continuity in disruptions.

However, alongside the opportunities presented by digital transformation, some formidable challenges and considerations warrant attention (Thinyane & Dube, 2019). Issues related to digital inequality, including disparities in access to technology and digital skills, pose significant barriers to realising the full potential of digital transformation in African higher education. Moreover, concerns surrounding data privacy, cybersecurity, and ethical implications of technology use underscore the importance of responsible and ethical integration of digital technologies within educational contexts (Tondeur et al., 2016). Additionally, the rapid pace of technological change necessitates ongoing professional development and capacity-building efforts to ensure educators have the requisite knowledge and skills to effectively leverage digital tools and pedagogies.

Looking ahead, socio-economic, political, and technological factors will likely shape the digital transformation trajectory in African higher education (Twining, 2017). The literature emphasises the need for collaborative and inclusive approaches that involve stakeholders across sectors to co-create sustainable solutions that address the unique contextual challenges and opportunities within the African higher education landscape (UNESCO, 2015). Furthermore, fostering a culture of innovation, experimentation, and knowledge sharing can facilitate the emergence of indigenous models of digital transformation that are responsive to local needs and aspirations (Voogt & Pelgrum, 2017). Realising the full potential of digital transformation in African higher education hinges on proactive policy formulation, strategic investments, and concerted efforts to harness technology as a catalyst for equitable access, quality, and relevance in education across the continent.

6. Discussion

The discussion of findings from this systematic literature review underscores the multifaceted nature of digital transformation in higher education across African nations and its implications for policy, practice, and research. The synthesis of existing research highlights a diverse array of adoption trends, implementation challenges, and institutional strategies that shape the region's digital transformation landscape. While some institutions have made significant strides in

integrating digital technologies into teaching and learning processes, others grapple with infrastructural limitations, funding constraints, and capacity gaps (Wende, 2001, 2015). Moreover, the literature underscores the importance of contextual factors such as socio-economic conditions, cultural norms, and regulatory frameworks in influencing the pace and trajectory of digital transformation initiatives (Wachira et al., 2019).

One key theme that emerges from the discussion is the critical role of leadership in driving and sustaining digital transformation efforts in higher education institutions. Effective leadership is characterised by visionary leadership, strategic planning, resource mobilisation, and stakeholder engagement. Leaders play a pivotal role in fostering a conducive environment for innovation, supporting faculty development initiatives, and championing institutional change processes (Brown, 2015; Wangenge-Ouma et al., 2015). Furthermore, leadership commitment is essential for navigating complex challenges such as resistance to change, organisational culture clashes, and competing priorities that may impede progress towards digital transformation goals.

Another salient point of discussion revolves around the importance of fostering digital literacy and skills development among faculty, students, and staff. The literature highlights the need for targeted interventions to enhance digital competencies, pedagogical skills, and technological fluency to effectively harness the potential of digital technologies for teaching, learning, and research. Capacity-building initiatives may include training workshops, professional development programs, and peer learning communities designed to empower stakeholders with the knowledge and skills to effectively leverage digital tools and resources (World Bank, 2019). Moreover, efforts to promote digital literacy should be accompanied by strategies to address digital divides and ensure equitable access to technology-enhanced learning opportunities for all academic community members (Wiers-Jenssen, 2009).

7. Implications of the Study

The implications drawn from this systematic literature review carry significant weight for various stakeholders involved in higher education across African nations and beyond. Firstly, the findings underscore the urgent need for policymakers, institutional leaders, and funding agencies to prioritise investments in digital infrastructure, human capital development, and regulatory frameworks to support the effective implementation of digital transformation initiatives. This entails allocating financial resources and fostering partnerships and collaborations with industry stakeholders, government agencies, and international organisations to leverage expertise, resources, and best practices in educational technology.

Secondly, the study highlights the importance of adopting a holistic and context-sensitive approach to digital transformation that considers African nations' unique socio-cultural, economic, and educational contexts (Ojo et al., 2020). One-size-fits-all solutions will likely fail in diverse and dynamic environments with varying technological readiness levels, infrastructural challenges, and educational priorities. Therefore, policymakers and educational leaders must engage in participatory decision-making processes that involve stakeholders from diverse backgrounds and perspectives to co-create solutions that are relevant, inclusive, and sustainable.

Thirdly, the study underscores the importance of fostering a culture of innovation, experimentation, and continuous improvement within higher education institutions to adapt to the rapidly evolving digital landscape. This entails creating enabling environments that support risk-taking, creativity, and collaboration among faculty, students, and staff. Moreover, institutions should embrace agile and iterative approaches to change management that allow for flexibility, adaptation, and learning from failures. By cultivating a culture of innovation, institutions can position themselves as hubs of creativity and excellence in leveraging digital technologies to enhance teaching, learning, and research.

Furthermore, the study emphasises the importance of fostering digital citizenship and ethical use of technology among students and educators (Selwyn, 2016). As digital technologies become increasingly integrated into educational practices, it is essential to promote responsible use, critical engagement, and ethical decision-making in digital environments (Afolabi & Ajani, 2023). This

requires comprehensive digital literacy programmes that not only focus on technical skills but also on ethical considerations, privacy concerns, information literacy, and digital well-being (Gamede et al., 2022). By equipping learners with the knowledge, skills, and values needed to navigate the complexities of the digital world, higher education institutions can empower them to become responsible digital citizens and lifelong learners (Maphalala & Ajani, 2024).

Lastly, the study underscores the need for further research to deepen our understanding of the dynamics, challenges, and opportunities associated with digital transformation in higher education within African contexts (Bates, 2019). Future research endeavours should adopt interdisciplinary approaches, leverage mixed-methods research designs, and engage diverse stakeholders to generate actionable insights and innovative solutions to pressing problems. Moreover, longitudinal studies are needed to track the long-term impacts of digital transformation initiatives on teaching and learning outcomes, institutional performance, and student success (Voogt & Pelgrum, 2017). By advancing the frontiers of knowledge and practice in educational technology, researchers can contribute to developing evidence-based policies, practices, and interventions that promote inclusive, equitable, and quality education for all.

8. Conclusion

This systematic literature review comprehensively analyses the digital transformation landscape in higher education across African nations and offers valuable insights for researchers, policymakers, educators, and other stakeholders. The study uses the diffusion of innovation theory. It combines findings from several scholarly works to show how digital transformation in higher education affects many areas, such as technology infrastructures, new ways of teaching, faculty development, student engagement, and institutional strategies. By identifying key trends, challenges, and opportunities, the study underscores the importance of context-sensitive approaches, stakeholder collaboration, and a culture of innovation in driving sustainable digital transformation initiatives. Moving forward, further research is needed to deepen our understanding of the complex dynamics at play and to develop evidence-based strategies for harnessing the potential of digital technologies to enhance teaching, learning, and research in higher education contexts across Africa and beyond (Czerniewicz et al., 2019).

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