ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 16 Issue, 01, pp. 69886-69892, January, 2026
https://doi.org/10.37118/ijdr.30518.01.2026

RESEARCH ARTICLE OPEN ACCESS

LINKING HUMAN CAPACITY, DIGITAL SYSTEMS, AND INSTITUTIONAL CONTEXTS FOR ONLINE LEARNING TRANSFORMATION IN PUBLIC UNIVERSITIES

***Agnes M. Gachau**

The Author is a Lecturer at the Technical University of Kenya

ARTICLE INFO

Article History:

Received 11th October, 2025
Received in revised form
19th November, 2025
Accepted 08th December, 2025
Published online 30th January, 2026

Key Words:

Digital systems; Human capacity; Institutional contexts; Learning Management Systems; Online learning transformation; Public universities; Technology adoption; Technology readiness.

****Corresponding author: Agnes M. Gachau,***

ABSTRACT

This book chapter provides a comprehensive conceptual synthesis of online learning transformation in public universities, framed through the integrated lenses of human capacity, digital systems, and institutional contexts. Rather than treating digital transformation as a purely technological shift, the chapter advances the argument that sustainable online learning is a systemic and multi-dimensional process shaped by the interaction of people, technologies, organisational structures, and policy environments. Drawing exclusively on established scholarly literature and theoretical perspectives, the chapter offers a coherent analytical narrative that situates public universitiesparticularly those in developing contextswithin global higher education digital transformation trends.The chapter begins by positioning online learning transformation as a response to global pressures such as technological advancement, changing learner expectations, and disruptions like the COVID-19 pandemic. It then introduces a Human Capacity–Digital Systems–Institutional Context framework to organise the discussion. Through this framework, the chapter examines the roles of students, lecturers, and ICT staff as central agents of transformation; the importance of ICT infrastructure, Learning Management Systems, and system integration; and the influence of leadership, policy frameworks, and organisational culture in shaping digital change.Theoretical perspectivesincluding the Technology Acceptance Model, UTAUT2, Diffusion of Innovation, the TOE framework, and the Technology Readiness and Acceptance Modelare applied analytically to explain patterns of adoption, resistance, and sustainability. An integrative discussion highlights why fragmented, technology-only approaches often fail and underscores the need for coordinated readiness across human, technological, and institutional dimensions. The chapter concludes by outlining policy, institutional, pedagogical, and research implications, offering guidance for building resilient, inclusive, and sustainable online learning ecosystems in public universities.

Citation: Agnes M. Gachau. 2026. "Linking human capacity, digital systems, and institutional contexts for online learning Transformation in Public Universities". *International Journal of Development Research*, 16, (01), 69886-69892.

INTRODUCTION

Online learning transformation has emerged as a defining feature of contemporary higher education, reshaping the organisation of teaching, learning, and institutional management worldwide. Rather than representing a simple transition from face-to-face instruction to virtual delivery, online learning transformation constitutes a complex and systemic process involving the dynamic interaction of human capacity, digital technologies, and institutional structures (Rogers, 2003; Venkatesh *et al*., 2020). This transformation encompasses shifts in pedagogical practices, technological infrastructures, organisational cultures, and policy environments, all of which must function coherently to support effective and sustainable digital education. Consequently, online learning cannot be adequately understood or implemented through isolated technological or pedagogical interventions, but must instead be approached as an interconnected system in which multiple actors and components mutually influence outcomes (Adera & Waema, 2023).

Globally, higher education institutions have accelerated the adoption of online and blended learning models in response to rapid technological advancement, evolving learner expectations, and major disruptions such as the COVID-19 pandemic (UNESCO, 2020). Universities across both developed and developing contexts increasingly rely on Learning Management Systems (LMS), digital content platforms, and online assessment tools to enhance instructional flexibility, widen access, and ensure continuity of learning (Johnson *et al*., 2019; Hodges *et al*., 2021). International organisations and policy bodies have further framed digital transformation as central to institutional resilience, innovation, and competitiveness within a globalised knowledge economy (OECD, 2023; World Bank, 2021). As a result, online learning is no longer regarded as a supplementary mode of delivery but has become a strategic component of mainstream higher education systems. Despite these global trends, public universities in developing contexts continue to face distinctive and persistent challenges in realising meaningful online learning transformation. Constraints associated with inadequate ICT infrastructure, unreliable connectivity, limited

digital competencies among students and academic staff, and uneven institutional readiness significantly shape the effectiveness of online learning initiatives (Mtebe & Raisamo, 2014; Tibugari & Mtebe, 2022). In addition, financial limitations, policy–practice gaps, and organisational resistance to change further complicate digital transformation efforts (Adebayo & Sule, 2021). These challenges demonstrate that technology adoption alone is insufficient to achieve sustainable online learning outcomes; rather, success depends on the alignment of human skills, digital systems, and supportive institutional environments. This reality underscores the need for integrated approaches to online learning transformation. Fragmented strategies that focus exclusively on infrastructure provision, skills training, or platform deployment often fail to generate lasting impact because they overlook the interdependence between people, systems, and institutional contexts (Parasuraman, 2000; TOE framework). A systemic perspective recognises that students' digital readiness, lecturers' pedagogical competencies, ICT staff technical capacity, institutional leadership, and policy frameworks must be aligned to support effective and inclusive online learning (Venkatesh *et al*., 2020). Accordingly, this chapter adopts a conceptual, literature-based synthesis to examine online learning transformation as a systemic process within public universities. Rather than presenting empirical findings, the chapter draws on existing scholarly literature and established theoretical perspectives to analyse how human capacity, digital systems, and institutional contexts interact to shape online learning transformation. Through this integrative lens, the chapter seeks to contribute to a deeper conceptual understanding of digital transformation in higher education, with particular relevance to public universities in developing contexts.

Conceptual Orientation and Organising Framework : Rather than adopting a traditional methodology section, this chapter is guided by a conceptual organising logic that structures the discussion around how online learning transformation occurs within public universities. Given that the chapter is grounded in a synthesis of existing literature rather than empirical investigation, a conceptual orientation is more appropriate for explaining the relationships, interactions, and dependencies among the key elements shaping digital transformation (Rogers, 2003; Baker, 2021). This approach allows the chapter to move beyond descriptive accounts of technology adoption and instead provide an integrative understanding of online learning transformation as a systemic and multi-dimensional process.

Rationale for an Integrated Perspective: The literature on online learning transformation consistently demonstrates that fragmented approachessuch as those focusing solely on technological infrastructure or isolated skills trainingare insufficient to produce sustainable and meaningful change (Mtebe & Raisamo, 2014; Tibugari & Mtebe, 2022). Technology-centred interventions that prioritise the acquisition of hardware, connectivity, or learning platforms often fail when users lack the competencies or confidence to utilise these tools effectively (Davis, 1989). Similarly, skills-focused initiatives that concentrate only on training students or lecturers may yield limited outcomes if the underlying digital systems are unreliable or if institutional structures do not support innovation and change (Johnson *et al*., 2019). Such fragmented strategies tend to frame digital transformation as a technical or individual problem rather than an organisational and systemic challenge (Adera & Waema, 2023). An integrated perspective recognises that online learning transformation is shaped by the alignment between people, systems, and institutions. Human actors require functional and accessible digital systems to apply their skills meaningfully, while digital systems depend on competent users and supportive organisational environments to deliver value (Venkatesh *et al*., 2020). Institutional leadership, policies, and cultures further influence how technologies are prioritised, resourced, and embedded into everyday academic practices (Baker, 2021). Without such alignment, investments in digital learning risk remaining underutilised, poorly integrated, or unsustainable, particularly within resource-constrained public university contexts.

Human Capacity–Digital Systems–Institutional Context Framework: To operationalise this integrated perspective, the chapter adopts a Human Capacity–Digital Systems–Institutional Context framework as its organising structure. This framework brings together three interdependent dimensions that collectively shape online learning transformation in public universities. The first dimension, human capacity, focuses on the competencies, roles, and readiness of key actors, namely students, lecturers, and ICT staff. Students' digital literacy, self-regulated learning skills, and access to technology influence their ability to engage effectively in online learning environments (OECD, 2023). Lecturers' pedagogical and technological competencies shape the quality of digital teaching, assessment, and learner support (Koehler & Mishra, 2016). ICT staff provide the technical expertise required to maintain, support, and innovate digital learning systems, thereby enabling system reliability and sustainability (Hodges *et al*., 2021). The second dimension, digital systems, refers to the technological infrastructure and platforms that support online learning. This includes ICT infrastructure such as connectivity, devices, and networks, as well as Learning Management Systems that mediate teaching, learning, and administrative processes (World Bank, 2021). These systems determine the reliability, accessibility, and scalability of online learning initiatives and directly shape user experiences and adoption.
The third dimension, institutional contexts, encompasses leadership, policy frameworks, organisational culture, and governance structures. Institutional contexts shape strategic priorities, resource allocation, and attitudes toward digital innovation (Baker, 2021). Supportive leadership and coherent policies can enable alignment across human capacity and digital systems, while weak governance or resistant cultures can undermine transformation efforts.

Human Capacity in Online Learning Transformation : Human capacity lies at the centre of online learning transformation, as digital technologies and institutional strategies ultimately depend on the people who design, support, and use them. Within higher education, students, lecturers, and ICT staff act as key agents whose skills, attitudes, and preparedness determine whether online learning initiatives translate into meaningful educational experiences (Venkatesh *et al*., 2020). A systemic view of online learning therefore recognises that human capacity is not a peripheral consideration but a foundational element shaping adoption, effectiveness, and sustainability.

Students as Active Digital Learners: Students play a pivotal role in online learning transformation, as their ability to engage effectively with digital platforms directly influences learning outcomes and institutional success. Digital literacy and ICT confidence are widely recognised as essential prerequisites for meaningful participation in online learning environments (OECD, 2023; UNESCO, 2022). Digital literacy extends beyond basic computer skills to include navigating learning management systems, critically evaluating online information, communicating effectively in digital spaces, and using technology responsibly. Students with higher ICT confidence are more likely to experiment with digital tools, seek support when challenges arise, and adapt to new learning technologies (UNICEF, 2021). Closely linked to digital literacy is the capacity for self-regulated learning and sustained engagement in online environments. Online learning requires students to manage their time, monitor progress, and maintain motivation to a greater extent than traditional classroom settings. Research indicates that students with strong self-regulation skillssuch as goal setting, self-monitoring, and reflective learningare better positioned to succeed in online and blended learning contexts (OECD, 2023). Issues of equity, access, and inclusion further shape students' online learning experiences. In developing contexts, disparities in access to devices, reliable connectivity, and conducive learning environments constrain student participation and reinforce existing inequalities (World Bank, 2021). These challenges underscore that student readiness is influenced not only by individual skills but also by broader structural and contextual conditions. Ultimately, students' readiness plays a critical role in sustaining online learning transformation. When students are digitally literate, confident, and adequately supported, they are more likely to

engage productively with online learning systems and to perceive digital learning as valuable and relevant (UNESCO, 2022).

Lecturers as Designers of Digital Pedagogy: Lecturers occupy a central position in online learning transformation, as they translate digital infrastructure and institutional strategies into meaningful learning experiences. Their role extends beyond content delivery to include the design, facilitation, and evaluation of digitally mediated learning activities (Johnson *et al*., 2019). Effective online learning therefore depends on lecturers' ability to integrate pedagogical knowledge with appropriate technological tools. A core requirement is the development of ICT pedagogical competencies, which encompass both technical skills and pedagogical understanding (Koehler & Mishra, 2016). Lecturers must design learner-centred activities, facilitate interaction in virtual spaces, and adapt teaching strategies to online and blended modalities. Where lecturers lack confidence or competence, digital tools tend to be used superficially, limiting pedagogical innovation (Mtebe & Raisamo, 2014). The capacity for e-content development and delivery is equally critical. Online learning requires lecturers to design digital materials that are accessible, engaging, and pedagogically sound, using multimedia and interactive tools. Inadequate preparation for digital content development often results in online learning replicating traditional lecture-based approaches rather than leveraging the affordances of technology (Johnson *et al*., 2019). Online assessment and feedback further shape the quality of digital pedagogy. Lecturers must align assessment with learning outcomes and use digital tools to support formative feedback and academic integrity. Timely feedback is particularly important in online contexts, where reduced interaction can affect student engagement. Frameworks such as Technological Pedagogical Content Knowledge (TPACK) provide valuable guidance by emphasising the integration of content, pedagogy, and technology (Koehler & Mishra, 2016). Lecturers' ability to design coherent digital pedagogy therefore remains a decisive factor in the sustainability of online learning transformation.

ICT Staff as Enablers of Digital Learning Ecosystems: ICT staff play a crucial yet often understated role in online learning transformation by enabling the technical and operational foundations of digital learning ecosystems (Hodges *et al*., 2021). Their contribution extends beyond routine technical support to include system design, maintenance, and continuous improvement. Technical readiness and specialised skills among ICT staffincluding network management, system integration, cybersecurity, and LMS administrationensure that digital platforms remain reliable, secure, and accessible (Venkatesh *et al*., 2020). Effective LMS administration and system support allow lecturers and students to focus on pedagogical activities, while poor support undermines usability and trust in digital systems. Beyond routine support, ICT staff drive innovation, troubleshooting, and system maintenance, adapting platforms to emerging needs and minimising disruptions to teaching and learning. Despite this, their contribution often remains invisible within institutional structures. Sustainable online learning transformation therefore depends on recognising ICT staff as strategic actors, investing in their capacity, and integrating them into institutional planning processes (Adera & Waema, 2023).

ICT Infrastructure and Connectivity: ICT infrastructure and connectivity constitute the foundational layer upon which online learning transformation in public universities is built. Reliable internet bandwidth, access to appropriate digital devices, and stable network systems are essential for supporting teaching, learning, communication, and assessment in online environments (World Bank, 2021; UNESCO, 2022). Without adequate connectivity, even well-designed digital platforms and digitally competent users are unable to function effectively. Existing literature consistently demonstrates that sufficient bandwidth and network reliability are prerequisites for uninterrupted access to learning management systems, synchronous teaching sessions, and digital learning resources (Hodges *et al*., 2021). Internet bandwidth and network reliability directly influence the quality of online learning experiences. High bandwidth supports real-time interactions such as video lectures, virtual discussions, and collaborative activities, while reliable networks reduce system downtime and disruptions (UNESCO, 2020). In many public universities within developing contexts, however, bandwidth limitations and unstable connectivity remain persistent challenges (World Bank, 2021). These constraints affect not only students' ability to participate in online learning but also lecturers' capacity to deliver interactive and media-rich instruction. Access to suitable digital devices further compounds these challenges, as students and staff may rely on shared, outdated, or incompatible hardware, thereby limiting effective engagement with online learning systems (OECD, 2023). Beyond immediate access concerns, infrastructure scalability and resilience are critical for sustaining online learning transformation. Scalable infrastructure enables universities to accommodate growing student populations, increased data demands, and expanded use of digital platforms without compromising system performance (UNESCO, 2022). Resilient systems are capable of withstanding disruptions such as power outages, cyber threats, or sudden increases in usage, thereby ensuring continuity of learning. The literature suggests that institutions investing in scalable and resilient ICT infrastructure are better positioned to respond to crises and integrate online learning as a long-term strategic component of higher education delivery (World Bank, 2021). Issues of digital divides and infrastructural inequalities further complicate online learning transformation. Disparities in connectivity between urban and rural areas, as well as between well-resourced and under-resourced institutions, continue to shape unequal learning experiences (UNICEF, 2021). Socio-economic factors also influence students' access to devices and data, reinforcing patterns of exclusion and limiting participation in online learning. Addressing these infrastructural inequalities requires coordinated institutional and policy interventions aimed at expanding access, improving connectivity, and ensuring that online learning initiatives promote equity rather than deepen existing divides (UNESCO, 2022).

Learning Management Systems as Core Digital Platforms: Learning Management Systems (LMS) function as the central digital platforms through which online learning in public universities is organised and delivered. LMS platforms integrate multiple academic and administrative functions, providing structured environments for teaching, learning, assessment, and communication (Davis, 1989; Venkatesh *et al*., 2020). In teaching and learning contexts, LMS platforms support content distribution, interactive learning activities, discussion forums, assessments, and feedback mechanisms. Administratively, they facilitate course management, enrolment, monitoring of student progress, and reporting, thereby linking instructional processes with institutional management systems (Hodges *et al*., 2021). As such, LMS platforms form the backbone of online learning ecosystems. The effectiveness of an LMS is strongly influenced by its usability, accessibility, and adoption among users. Usability refers to the ease with which students and lecturers can navigate the platform, access resources, and complete learning tasks without excessive technical difficulty (Davis, 1989). Accessible LMS design ensures that users with diverse needs, including those with disabilities, can engage meaningfully with online learning content. Adoption depends largely on users' perceptions of system usefulness and ease of use, as well as the availability of technical and pedagogical support (Venkatesh *et al*., 2020). When LMS platforms are perceived as complex or unreliable, users may disengage or resort to alternative, less integrated tools. Beyond technical functionality, the success of LMS platforms depends on the alignment between LMS design and pedagogy. An LMS should not merely function as a repository for instructional materials but should support active, learner-centred pedagogical approaches. This requires deliberate instructional design that leverages LMS features such as collaborative tools, formative assessments, and learning analytics to enhance engagement and learning outcomes (OECD, 2023). Misalignment between pedagogical goals and LMS design often results in limited utilisation of platform capabilities, reducing online learning to passive content consumption. The literature further suggests that effective LMS implementation requires continuous evaluation and adaptation to ensure that platform design remains responsive to evolving teaching practices and learner needs (Hodges *et al*., 2021). Aligning

LMS functionality with pedagogical intentions is therefore essential for maximising the educational value of online learning systems in public universities.

System Integration, Security, and Sustainability: Effective online learning transformation depends not only on the availability of digital platforms but also on the integration, security, and long-term sustainability of institutional digital systems. System integration refers to the extent to which learning management systems, student information systems, library platforms, finance systems, and communication tools operate cohesively across university functions (World Bank, 2021). Integrated systems enable seamless data sharing, reduce duplication of effort, and enhance efficiency in academic and administrative processes. In online learning contexts, such integration supports smoother enrolment processes, coherent learning experiences, and reliable tracking of student progress across multiple platforms (UNESCO, 2022). In parallel, cybersecurity and data protection have become critical concerns in digitally mediated higher education environments. Online learning systems process large volumes of sensitive data, including personal information, academic records, and assessment materials. The literature highlights growing risks associated with cyber threats, data breaches, and unauthorised access, particularly in institutions with limited technical capacity or outdated security protocols (World Bank, 2021). Ensuring data protection requires robust security policies, secure system architectures, regular software updates, and user awareness of digital risks. Without adequate cybersecurity measures, online learning systems may lose user trust and compromise institutional credibility.

The long-term sustainability and maintenance of digital systems represent another crucial dimension of online learning transformation. Sustainable systems require continuous financial investment, skilled technical personnel, and strategic planning to accommodate technological change (UNESCO, 2022). Regular maintenance, system upgrades, and responsive user support are essential to ensure that platforms remain functional, relevant, and secure over time. In resource-constrained public universities, sustainability is often undermined by short-term project funding, reliance on external donors, and limited institutional capacity for ongoing system support.

The literature emphasises that sustainable online learning transformation must move beyond ad hoc implementations toward institutionalised digital strategies. Integrating systems, strengthening security, and planning for long-term maintenance are therefore essential for building resilient digital learning ecosystems capable of supporting quality higher education in the long run (OECD, 2023).

Institutional Contexts Shaping Online Learning Transformation: Online learning transformation does not occur in isolation from the organisational environments in which universities operate. Institutional contexts play a decisive role in shaping how human capacity and digital systems are mobilised, coordinated, and sustained within higher education institutions (Baker, 2021; Osei & Ackon, 2023). Leadership structures, governance arrangements, and organisational priorities influence whether digital initiatives are strategically embedded within institutional operations or implemented as fragmented and short-term projects. As such, understanding online learning transformation requires situating digital initiatives within broader organisational realities, including leadership practices, policy frameworks, and institutional cultures (Venkatesh *et al*., 2020).

Institutional Readiness and Leadership: Institutional readiness and leadership are central to the successful transformation of online learning in public universities. Strategic leadership provides direction, coherence, and legitimacy to digital initiatives by articulating a clear vision for online and blended learning (Sang, 2024). When university leaders explicitly prioritise digital transformation within institutional strategies, online learning is more likely to be integrated into core academic and administrative functions rather than treated as a temporary or peripheral response to external pressures (Baker, 2021). Visionary leadership also plays a critical role in fostering a shared understanding of the purpose and value of online learning among staff and students, thereby enhancing institutional commitment to digital change. Effective leadership is closely linked to resource allocation and prioritisation. Online learning transformation requires sustained investment in ICT infrastructure, human capacity development, and system maintenance (Adera & Waema, 2023). Institutional leaders influence how financial, technical, and human resources are distributed across competing priorities. Where resources are allocated strategically, universities are better positioned to build reliable digital systems, support continuous staff training, and address student access challenges. Conversely, inconsistent or insufficient resourcing can undermine digital initiatives, leading to underutilised platforms, staff fatigue, and stalled transformation efforts (Tibugari & Mtebe, 2022).

Leadership further shapes an institution's capacity to manage digital change and innovation. Online learning transformation often disrupts established pedagogical practices, organisational routines, and power relations, generating resistance and uncertainty (Rogers, 2003). Institutional leaders play a critical role in guiding universities through this change by promoting inclusive decision-making, encouraging experimentation, and supporting continuous organisational learning. By cultivating cultures that value adaptability and innovation, leadership can help institutions navigate the complexities of digital transformation. Ultimately, institutional readiness reflects not only technological preparedness but also leadership capacity to align vision, resources, and change processes in support of sustainable online learning (Osei & Ackon, 2023).

Policy Frameworks and National Digital Agendas: Policy frameworks and national digital agendas provide the broader enabling environment within which online learning transformation in public universities unfolds. ICT-in-education policies articulate government commitments to integrating digital technologies into teaching, learning, and institutional management, often outlining goals related to infrastructure development, digital skills enhancement, equity of access, and quality assurance (UNESCO, 2022). For public universities, such policies serve as important reference points that legitimise digital learning initiatives and guide institutional planning and investment decisions. Closely linked to education-specific policies are national digital transformation strategies, which situate higher education within wider socio-economic development agendas. National digital strategies typically emphasise expanding broadband connectivity, strengthening digital infrastructure, and building human capital to support participation in the digital economy (World Bank, 2021). By aligning higher education digitalisation with national development priorities, these strategies underscore the strategic role of universities in fostering innovation, research, and skills development. For public universities, national digital agendas may also unlock funding opportunities, partnerships, and regulatory support necessary for scaling online learning initiatives. However, the effectiveness of policy frameworks is contingent upon policy–practice alignment within public universities. While national policies may articulate ambitious digital goals, their impact is shaped by how they are interpreted, operationalised, and resourced at the institutional level (Baker, 2021). Gaps frequently emerge between policy aspirations and institutional realities due to limited funding, inadequate technical capacity, or weak coordination among stakeholders. In some cases, policies place disproportionate emphasis on infrastructure provision without corresponding attention to human capacity development or organisational readiness, resulting in uneven implementation (Adera & Waema, 2023). The literature therefore highlights the importance of translating policy objectives into actionable institutional strategies that are responsive to local contexts and constraints. Effective alignment requires clear communication, supportive regulatory environments, and mechanisms for monitoring and evaluation (UNESCO, 2022). When policy frameworks are coherently aligned with institutional practices, public universities are better positioned to implement sustainable and inclusive online learning initiatives that contribute meaningfully to national digital transformation goals.

Organisational Culture and Digital Change: Organisational culture plays a critical role in shaping how online learning transformation is perceived, adopted, and sustained within public universities. Beyond formal policies and technological investments, cultural factors such as shared values, beliefs, and norms influence institutional responses to

digital change (Rogers, 2003). Institutional attitudes toward technology determine whether online learning is embraced as an opportunity for innovation or resisted as a disruption to established academic practices. Where technology is associated with relevance and improvement, digital initiatives are more likely to gain acceptance and momentum. The literature identifies varying patterns of resistance, acceptance, and innovation cultures in higher education institutions. Resistance may stem from concerns about increased workload, perceived threats to academic autonomy, or uncertainty regarding the pedagogical value of online learning (Tibugari & Mtebe, 2022). Acceptance is more likely in environments where staff and students are supported through training, transparent communication, and inclusive decision-making processes. Innovation-oriented cultures go further by encouraging experimentation, collaboration, and reflective practice, enabling institutions to adapt digital tools creatively to their unique contexts (Sang, 2024). Organisational norms also shape the everyday adoption and use of online learning systems. Norms governing teaching practices, assessment methods, and communication patterns influence how extensively digital platforms are utilised. Institutions with strong traditions of face-to-face instruction may integrate online learning cautiously or limit its use to supplementary functions, whereas universities that normalise blended and online modalities are more likely to embed digital learning into core academic processes (Venkatesh *et al*., 2020). Informal norms, including peer influence and departmental practices, can be as influential as formal policies in shaping technology use. Ultimately, sustainable online learning transformation requires deliberate efforts to cultivate organisational cultures that value learning, adaptability, and innovation. Aligning cultural norms with digital transformation goals enables public universities to move beyond compliance-driven adoption toward meaningful and sustained use of online learning systems.

Theoretical Perspectives Informing Integration: The integration of human capacity, digital systems, and institutional contexts in online learning transformation is best understood through the application of complementary theoretical perspectives. In this chapter, theory is used analytically rather than descriptively, serving as an interpretive lens for explaining how and why interactions among people, technologies, and organisational environments shape digital transformation outcomes in public universities. Prior scholarship emphasises that digital transformation in higher education is a multi-layered process influenced by individual behaviour, organisational structures, and broader environmental conditions (Rogers, 2003; Venkatesh *et al*., 2020). Drawing on established models of technology acceptance, innovation, and readiness, this section highlights how these theories collectively illuminate the systemic nature of online learning transformation.

Technology Acceptance and Use: The Technology Acceptance Model (TAM) provides a foundational explanation of how individuals come to accept and use digital technologies. TAM posits that perceived usefulness and perceived ease of use are the primary determinants of users' attitudes and behavioural intentions toward technology adoption (Davis, 1989). In the context of online learning, TAM helps explain variations in how students and lecturers engage with learning management systems and digital tools. When digital systems are perceived as enhancing teaching or learning effectiveness and are easy to navigate, adoption and sustained use are more likely (Johnson *et al*., 2019). However, TAM also indicates that individual acceptance is shaped by institutional factors such as system reliability and organisational support, linking user behaviour to broader institutional contexts. Building on TAM, the Unified Theory of Acceptance and Use of Technology (UTAUT2) extends this analysis by incorporating facilitating conditions, social influence, and user motivation (Venkatesh *et al*., 2020). UTAUT2 is particularly useful for understanding technology use in institutional settings because it emphasises the role of organisational support, peer norms, and resource availability. In public universities, facilitating conditionssuch as technical support from ICT staff and reliable infrastructuremediate the relationship between individual intention and actual system use, underscoring the interdependence between human capacity and digital systems (Hodges *et al*., 2021).

Innovation and Organisational Change: While acceptance models focus primarily on individual behaviour, theories of innovation provide insight into organisational dynamics. The Diffusion of Innovation (DOI) theory explains how new technologies spread within organisations over time, influenced by factors such as relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003). DOI helps explain why online learning adoption varies across institutions and departments, with some acting as early adopters while others resist change. This perspective highlights the influence of institutional culture, leadership, and communication in shaping digital transformation trajectories. Complementing DOI, the Technology–Organisation–Environment (TOE) framework emphasises that technology adoption is shaped by organisational capacity and external environmental pressures (Baker, 2021). TOE draws attention to institutional readiness, resource availability, and regulatory environments that enable or constrain online learning initiatives. Through this lens, digital systems are understood not as standalone tools but as technologies embedded within organisational and policy contexts that shape adoption and sustainability (Adera & Waema, 2023).

Technology Readiness and Psychological Preparedness: The Technology Readiness and Acceptance Model (TRAM) integrates psychological readiness with technology acceptance, offering further insight into individual responses to digital systems (Parasuraman, 2000). TRAM highlights how traits such as optimism and innovativeness, as well as discomfort and insecurity, influence users' willingness to adopt and use technology. In online learning contexts, TRAM helps explain why similar digital environments may yield different outcomes depending on users' confidence, trust, and prior experiences with technology. This perspective reinforces the importance of addressing both psychological readiness and institutional support when implementing online learning systems in public universities.

Integrative Discussion: Aligning Capacity, Systems, and Contexts: Online learning transformation in public universities cannot be achieved through technology-only solutions, as digital platforms and infrastructure do not function independently of the people and institutional environments that shape their use. The literature consistently demonstrates that investments in hardware, connectivity, or learning management systems frequently fail to yield meaningful outcomes when human capacity and institutional readiness are not addressed concurrently (Adera & Waema, 2023; Tibugari & Mtebe, 2022). Technology-centred interventions that overlook skills development, organisational support, and cultural acceptance often result in underutilised systems, user resistance, and fragmented implementation (Hodges *et al*., 2021). This evidence underscores the limitations of conceptualising online learning transformation as a purely technical challenge. A systemic perspective reveals the interdependence among students, lecturers, ICT staff, infrastructure, and institutional leadership. Students' ability to engage effectively in online learning environments depends on their levels of digital literacy, access to devices, and confidence in using digital systems (UNESCO, 2022; OECD, 2023). Lecturers' capacity to design and facilitate digital pedagogy relies not only on pedagogical competence but also on the availability of reliable platforms and sustained technical support (Koehler & Mishra, 2016; Johnson *et al*., 2019). ICT staff, in turn, require adequate resources, specialised skills, and institutional recognition to maintain, secure, and innovate digital systems that support teaching and learning (Hodges *et al*., 2021; Adera & Waema, 2023). Institutional leadership and governance structures shape how these components are aligned through strategic vision, resource allocation, and change management processes (Rogers, 2003; Baker, 2021). Weaknesses in any one of these elements can compromise the effectiveness of the entire digital learning ecosystem. This interdependence highlights the need for coordinated readiness and systemic alignment. Effective online learning transformation requires synchronised investments in ICT

infrastructure, human capacity development, institutional policies, and organisational culture (Venkatesh *et al*., 2020; Baker, 2021). Coordinated readiness ensures that human skills are matched with functional and usable digital systems and supported by enabling institutional environments. Such alignment reduces implementation gaps, strengthens user confidence, and enhances the sustainability of digital learning initiatives over time. For public universities in developing contexts, these insights carry particularly important lessons. Resource constraints, infrastructural inequalities, and diverse student needs demand holistic and context-sensitive approaches to digital transformation (UNESCO, 2022; World Bank, 2021). Rather than replicating models from well-resourced institutions, public universities must adopt integrated strategies that balance technological advancement with investments in human and institutional capacity. By embracing systemic alignment, public universities can move beyond short-term digital responses toward sustainable online learning ecosystems that support equitable access, institutional resilience, and quality higher education.

Implications of the Conceptual Synthesis: The conceptual synthesis presented in this chapter underscores that online learning transformation in public universities is a systemic process requiring the coordinated alignment of human capacity, digital systems, and institutional contexts (Adera & Waema, 2023; Tibugari & Mtebe, 2022). Rather than viewing digital transformation as a technical intervention, the synthesis highlights the interdependence between people, technologies, and organisational environments. From this integrated perspective, several important implications emerge for policy, institutional practice, pedagogy, and future research, particularly within developing contexts where resource constraints and digital inequalities remain pronounced (UNESCO, 2022; World Bank, 2021).

Policy Implications: At the policy level, there is a clear need for integrated digital readiness frameworks that move beyond narrow infrastructure-focused interventions. National ICT-in-education policies should explicitly recognise the interdependence between technology, human skills, and institutional capacity (OECD, 2023; UNESCO, 2020). Such frameworks should incorporate provisions for digital literacy development, continuous professional training, and institutional governance mechanisms alongside infrastructural investment. In addition, policies must prioritise digital equity and access strategies to address persistent disparities in connectivity, device ownership, and learning environments (UNICEF, 2021; World Bank, 2021). Targeted support for marginalised student populations, rural institutions, and under-resourced universities is essential to ensure that online learning initiatives contribute to inclusion rather than reinforcing existing inequalities.

Institutional Practice Implications: For public universities, the synthesis highlights the importance of adopting holistic capacity-building models that address the needs of students, lecturers, and ICT staff concurrently (Johnson *et al*., 2019; Mtebe & Raisamo, 2014). Professional development initiatives should be continuous, role-specific, and aligned with institutional digital strategies rather than implemented as ad hoc training sessions. Strengthening ICT staffing and governance structures is equally critical. Universities require adequately resourced ICT units with clearly defined roles, career pathways, and representation in institutional decision-making processes (Adebayo & Sule, 2021). Such governance arrangements enable ICT staff to contribute strategically to digital transformation rather than functioning solely as technical support providers. Furthermore, effective LMS management and oversight are necessary to ensure consistent platform use, quality assurance, and alignment with pedagogical goals (Hodges *et al*., 2021).

Pedagogical Implications: The synthesis also carries significant pedagogical implications. Lecturers require sustained professional development to enhance their digital pedagogical competencies, including instructional design, online facilitation, and digital assessment practices (Koehler & Mishra, 2016). Institutions should promote pedagogical innovation by encouraging experimentation with blended and online teaching approaches supported by appropriate institutional incentives. In addition, there is a need for rethinking assessment in online learning. Traditional assessment models may be ill-suited to digital environments, necessitating alternative approaches that emphasise formative feedback, authenticity, and academic integrity (Johnson *et al*., 2019). Aligning assessment practices with digital pedagogies can improve student engagement and learning outcomes.

Research Implications: Finally, the chapter highlights important research implications. There is a need for longitudinal and experience-based studies that examine how digital readiness and online learning practices evolve over time, particularly in public universities within developing contexts (Tibugari & Mtebe, 2022). Such research can provide deeper insights into sustainability and institutional learning processes. Additionally, multi-actor digital transformation research is required to capture the perspectives and interactions of students, lecturers, ICT staff, and institutional leaders (Venkatesh *et al*., 2020). By adopting integrative research approaches, future studies can generate richer understandings of how systemic alignment influences online learning transformation in public universities maintaining the recommended standards.

CONCLUSION

This chapter has examined online learning transformation in public universities through an integrated conceptual lens that brings together human capacity, digital systems, and institutional contexts. A key insight emerging from the synthesis is that online learning transformation is not a purely technological undertaking, but a complex and systemic process shaped by the interaction of people, infrastructure, organisational structures, and policy environments (Adera & Waema, 2023; OECD, 2023). Students' digital readiness, lecturers' pedagogical competencies, and ICT staff technical capacity collectively influence how digital systems are adopted and sustained, while institutional leadership, organisational culture, and policy frameworks determine the coherence and effectiveness of these efforts (Johnson *et al*., 2019; Mtebe & Raisamo, 2014). The analysis underscores the value of an integrated approach to online learning transformation. Fragmented interventions that focus exclusively on technology acquisition, isolated skills training, or policy formulation are unlikely to generate lasting impact when implemented independently (UNESCO, 2022; Tibugari & Mtebe, 2022). Instead, sustainable transformation requires alignment across human, technological, and institutional dimensions. An integrated approach enables universities to synchronise capacity-building initiatives with infrastructure development, embed digital learning within institutional strategies, and foster organisational cultures that support innovation and adaptability (Rogers, 2003; Venkatesh *et al*., 2020). Such alignment is particularly critical for public universities in developing contexts, where resource constraints and infrastructural inequalities necessitate efficient, context-sensitive, and coordinated digital strategies (World Bank, 2021; UNICEF, 2021).

Looking ahead, future directions for online learning transformation in public universities should prioritise systemic readiness, quality standards and long-term sustainability. Institutions and policymakers must continue to invest in digital infrastructure while simultaneously strengthening human capacity, leadership, and governance frameworks that support effective implementation (OECD, 2023; UNESCO, 2020). Greater emphasis should be placed on inclusive digital practices that address equity and access challenges, as well as on pedagogical innovation that enhances student engagement and learning outcomes (Hodges *et al*., 2021). From a scholarly perspective, future research should adopt integrative and longitudinal approaches to better understand how online learning ecosystems evolve over time and how alignment among actors, systems, and institutional contexts shapes sustainable transformation. By embracing holistic and coordinated strategies, public universities can advance online learning transformation as a durable, inclusive, and strategic component of higher education delivery.

REFERENCES

Adebayo, A. A., & Sule, I. 2021. Digital readiness and e-learning adoption in African universities. *African Journal of Educational Technology*, 6(2), 45–59.

Adera, E. O., & Waema, T. 2023. Digital transformation in African higher education: Infrastructure, skills, and institutional readiness. *Information Development,* 39 (1), 34–48. https://doi.org/ 10.1177/02666669221087543

Davis, F. D. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340. https://doi.org/10.2307/249008

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. 2021. The difference between emergency remote teaching and online learning. *Educause Review*, 27(1), 1–12.

Johnson, N., Veletsianos, G., & Seaman, J. 2019. U.S. faculty and administrators' experiences and approaches in online learning environments. *Online Learning Journal, 23*(2), 1–21. https://doi.org/10.24059/olj.v23i2.2078

Koehler, M. J., & Mishra, P. 2016. Introducing technological pedagogical content knowledge. In M. J. Koehler & P. Mishra (Eds.), Handbook of technological pedagogical content knowledge for educators (2nd ed., pp. 1–14). Routledge.

Mtebe, J. S., & Raisamo, R. 2014. Challenges and instructors' intention to adopt and use open educational resources in higher education in Tanzania. *International Review of Research in Open and Distributed Learning***,** 15(1), 249–271. https://doi.org/ 10.19173/irrodl.v15i1.1687

OECD. 2023. Education at a glance 2023: OECD indicators. OECD Publishing. https://doi.org/10.1787/eag-2023-en

Parasuraman, A. 2000. Technology readiness index (TRI): A multiple-item scale to measure readiness to embrace new technologies. Journal of Service Research**, 2**(4), 307–320. https://doi.org/10.1177/109467050024001

Rogers, E. M. 2003. Diffusion of innovations (5th ed.). Free Press.

Tibugari, V. L., & Mtebe, J. S. (2022). E-learning adoption in higher education institutions in developing countries: A systematic review. Education and Information Technologies**,** 2**7**(5), 6781–6806. https://doi.org/10.1007/s10639-021-10806-4

UNESCO. 2020. Education in a post-COVID world: Nine ideas for public action. UNESCO.

UNESCO. 2022. Digital learning and transformation of education systems**.** UNESCO.

UNICEF. 2021. Reimagining education: The digital learning imperative**.** UNICEF.

Venkatesh, V., Thong, J. Y. L., & Xu, X. 2012. Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. MIS Quarterly, 36(1), 157–178. https://doi.org/10.2307/41410412

Venkatesh, V., Thong, J. Y. L., & Xu, X. 2020. Unified theory of acceptance and use of technology: A synthesis and the road ahead. Journal of the Association for Information Systems, 17(5), 328–376. https://doi.org/10.17705/1jais.00428

World Bank. (2021). Digital technologies in education: Opportunities and challenges. World Bank.

****