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Digital Transformation of Higher Education: A Post-COVID Review of Adoption, Quality Assurance, and Governance Challenges

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ABSTRACT: The COVID-19 pandemic catalyzed a historic, if uneven, digital pivot in global higher education. This study offers a post-pandemic, theory-driven synthesis of how universities have navigated digital transformation, with particular attention to adoption patterns, quality assurance (QA), and governance reform. Drawing on a comprehensive corpus of literature (2020–2025), global datasets (UNESCO, World Bank), and comparative case studies from Rwanda, India, and the U.S., we interrogate not only the empirical outcomes but the normative architectures underpinning higher education's digital turn. Integrating Institutional Theory, Diffusion of Innovation, and Complexity Theory, we propose a multi-stage conceptual framework—"external shock → institutional response → digital adoption → QA adaptation → governance outcomes"—to analyze systemic shifts. Our findings reveal a persistent digital divide: while technological adoption surged, access disparities and epistemic inequities remain entrenched. QA mechanisms, originally designed for analog contexts, often lag behind digital delivery, leading to improvised standards or suspended accreditation. Governance responses diverge across neoliberal, social-democratic, and hybrid regimes, shaping institutional resilience and equity impact. We argue that platform-mediated education risks entrenching epistemic injustice, commodifying pedagogy, and centralizing power in global EdTech monopolies. Yet counter-trends emerge: local innovation in the Global South—mobile-first micro-credentials, offline content, and collaborative governance models—demonstrates alternative trajectories. We conclude by advancing a normative call for technological solidarity: an approach to digital transformation grounded in equity, openness, and participatory governance. This study contributes to global debates on higher education's future, offering theoretical integration and policy foresight for a post-COVID landscape defined not by inevitability, but by institutional choices and moral commitments.

KEYWORDS: digital transformation; higher education governance; quality assurance; post-pandemic pedagogy; EdTech equity; hybrid learning futures; institutional adaptation

1. INTRODUCTION

The COVID-19 crisis precipitated a **sudden digital pivot** in higher education: campuses worldwide closed and institutions rushed to deploy remote learning platforms. This emergency response ensured short-term continuity, but also laid bare critical weaknesses in educational ecosystems. UNESCO reports that globally 826 million learners were kept out of classrooms, and about 43% of students (over 700 million) had no home internet access when the shift to distance learning began (UNESCO, 2020). Updated connectivity estimates are provided in Table 1. These figures mirror other estimates: roughly half the world's population still lacks internet connectivity, leaving nearly one-third of students unable to engage in remote classes (UNESCO, 2021). The crisis therefore amplified pre-existing inequalities in digital access, which are stark in developing regions. For example, only one-third of primary schools in sub-Saharan Africa have electricity and fewer than half worldwide have internet (UNESCO, 2020), hindering e-learning in many communities.

Table 1. Global school Internet-connectivity rates, 2023.

Education level	Schools connected %
Primary	**40**
Lower Secondary	**50**
Upper Secondary	**65**

Source: UNESCO GEM Report 2023.

In the **immediate aftermath**, universities and governments attempted to institutionalize these changes. Many higher education leaders now regard digital education as a permanent priority, yet the post-pandemic period reveals **persistent challenges**. Authoritative reviews (e.g. UNESCO, World Bank) highlight gaps in EdTech adoption and digital equity. UNESCO underscores that most students still lack adequate devices or connectivity to use online content (UNESCO, 2021), while World Bank analyses warn that without careful design, EdTech can widen inequities (World Bank, 2020). Simultaneously, **quality assurance** mechanisms have struggled to keep pace. Traditional accreditation rules, premised on face-to-face delivery, were temporarily relaxed in some countries, but remain misaligned with online modalities (World Bank, 2020). Academic integrity and student engagement in remote environments also raise new concerns.

Recent analyses confirm that the epicentre of post-pandemic innovation is shifting southwards. UNESCO's 2024 thematic brief on *Digital infrastructures for education* notes that universities in Kenya, Rwanda and India are now "living laboratories" for low-bandwidth, mobile-first micro-credential ecosystems designed for learners previously excluded from campus life (UNESCO, 2024). Their experience illustrates that digital transformation is not a unidirectional transfer of Northern know-how but a polycentric dialogue in which the Global South increasingly sets the agenda for inclusive pedagogy.

Likewise, **governance of higher education** has lagged behind the technology. Universities often lacked coordinated digital strategies or leadership structures for online learning, and many policy systems did not have clear standards for remote instruction. The pandemic experience underscores the need to reassess institutional resilience and regulatory readiness. For instance, as the World Bank suggests, governments must adapt accreditation regulations to more flexibly cover online and hybrid programs (World Bank, 2020).

Research gap and questions. While extensive documentation exists on the immediate educational response to COVID-19, less is known about the long-term trajectory of digital transformation in universities. In particular, it remains unclear how institutions are addressing governance and pedagogical quality in the new normal of blended and online formats. This study investigates that post-pandemic juncture. We frame the problem as follows: despite massive digital adoption during the crisis, many universities have not fully integrated these innovations into their core strategies. Quality assurance processes and accreditation remain predominantly analog, and governance structures often lack accountability mechanisms for digital learning.

The study objective is to map the **system-wide landscape** of post-COVID digital education: identifying which governance mechanisms enable or inhibit sustainable adoption, how QA frameworks are evolving (or failing to evolve), and where inequities persist. Accordingly, we pose four research questions: (1) *How have higher education institutions adopted digital learning since the COVID-19 pandemic?* (2) *What quality assurance mechanisms have been implemented to maintain academic standards in online and hybrid learning?* (3) *How do institutional governance structures impact the effectiveness and sustainability of digital transformation?* (4) *What challenges and opportunities remain for advancing equitable, quality-driven digital education in the post-COVID era?* To ground our analysis, we focus primarily on the **Global South** (with detailed case studies of Rwanda and India) while drawing comparisons to OECD contexts (e.g. US accreditation) to highlight contrasts.

Roadmap: The remainder of this article unfolds in five stages that build a cumulative argument toward our synthesized framework. Section 2 grounds the study in Institutional, Diffusion-of-Innovation, and Complexity theories, revealing how each lens problematises the post-COVID turn to digital learning and sets normative stakes around power and epistemic equity. Section 3 details our mixed-methods approach—systematic literature mapping, secondary-data triangulation, and comparative case analysis—which supplies the empirical foundation for critical interpretation. Section 4 presents a **critical analysis of post-COVID digital transformation**, moving from adoption patterns and infrastructure inequalities (4.1) through emergent quality-assurance dilemmas (4.2) and contrasting governance rationalities (4.3), before reflecting on theoretical implications (4.4) and articulating the risks and normative opportunities that flow from our findings (4.5). Section 5 distils these insights into forward-looking policy recommendations and research frontiers, thereby closing the loop between theory, evidence, and actionable foresight.

By synthesizing recent empirical data, policy reports, and academic studies, we aim to produce a conceptually rigorous and foresight-driven analysis of higher education's digital transition. This work contributes to theoretical integration (linking Institutional, Diffusion, and Complexity perspectives) and offers actionable insights for university leaders, policymakers, and accreditors grappling with the enduring impact of the pandemic on education.

2. THEORETICAL & CONCEPTUAL FRAMEWORK

Digital transformation in higher education is far from a neutral, technocratic evolution; it is a re-articulation of power, knowledge, and subjectivity. From a Foucauldian perspective, the "emergency" pivot to edtech represents a mode of **governmentality** whereby dashboards, learning analytics, and accreditation check-lists operate as subtle technologies of control that discipline staff and students at a distance (Romanowski, 2022). Read through Habermas's lens of **communicative rationality**, the same pivot risks subordinating the deliberative mission of the university to instrumental logics of efficiency encoded by platform vendors and algorithmic policy dashboards (Komljenovic et al., 2024). Positioning Institutional, Diffusion, and Complexity theory against this critical backdrop therefore transforms them from descriptive lenses into normative critiques, inviting us to ask not only *how* universities adapt, but *whose* interests such coerced adaptations ultimately serve and *which* academic voices are rendered silent in the process. To interpret the complex dynamics of post-pandemic digital transformation, we draw on three leading perspectives:

Institutional Theory highlights how universities are embedded in formal structures, norms, and regulatory regimes. Institutional inertia and path dependence can delay innovation, but crises can impose coercive pressure that compels change. For example, Lu and colleagues found that Taiwan faculty, initially unprepared for online teaching, experienced "sudden institutional coercive pressure" which ultimately *accelerated* their intent to adopt distance teaching (Lu & Wang, 2023). This suggests that emergency mandates (e.g. government orders to move online) can override internal resistance, aligning with institutional isomorphism concepts. In higher education, we therefore expect that pre-existing policies and accreditation rules both enable and constrain digital adoption; unprecedented shocks like COVID-19 can catalyze reforms, but sustained change requires shifting entrenched practices.

Diffusion of Innovation provides a lens for understanding how various stakeholders embrace new edtech. According to Rogers' model, adoption follows an S-curve from innovators to laggards. A survey of Turkish academics during COVID-19 found the typical distribution of adopters was altered: 11% were "innovators" who immediately embraced online teaching, while about 26% remained "laggards" even in crisis conditions (Çakıroğlu et al., 2022). The emergency context compressed these categories and emphasized institutional support factors. Our analysis uses diffusion thinking to classify adoption trajectories: for instance, we examine which universities or countries acted as early adopters of e-learning platforms and which lagged, and how attributes like resources, training, and peer influence shaped the spread of digital pedagogy.

Complexity Theory views higher education as a complex adaptive system of interrelated agents (students, faculty, administrators) and institutions (departments, regulators) interacting under varying conditions. In such systems, small inputs can have nonlinear, unpredictable outcomes: for example, a policy to distribute tablets to students may produce ripple effects on curriculum design or faculty roles. Complexity theory underscores the web of dependencies – technological, social, economic – that mediate digital transformation (Bento et al., 2021). It also highlights emergence: new governance models or learning communities can arise spontaneously. We thus analyze post-COVID higher ed through complexity notions: examining how internal (faculty skillsets, institutional culture) and external (policy changes, funding shifts) subsystems co-evolve, and how enabling feedback loops or bottlenecks emerge. For example, support from one department can self-organize into a broader online teaching center, affecting system-level adaptation.

Synthesizing these perspectives, we propose a conceptual model (Figure 1) in which the external shock of COVID-19 (UNESCO, 2020) triggers institutional responses (emergency policies, leadership directives) that drive digital adoption (Çakıroğlu et al., 2022; Lu & Wang, 2023) at multiple levels (classroom, program, campus). This adoption in turn exposes gaps in quality assurance (World Bank, 2020) (requiring new standards and monitoring), which then loops back to influence governance outcomes (such as revised accreditation guidelines, funding allocations, and equity impacts) (Poulin, 2022; Matsieli & Mutula, 2024). The model suggests, for example, that without adaptive QA, rapid online expansion could undermine educational quality – an outcome shaped by the complex interplay of all components.

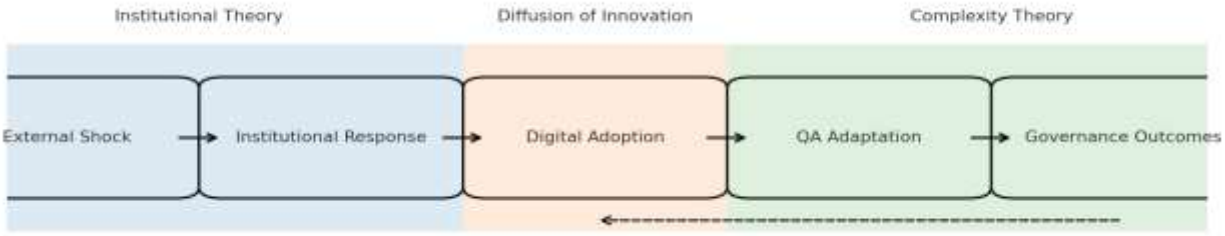

Figure 1. Conceptual framework linking the COVID-19 external shock to institutional response, digital adoption, quality-assurance adaptations, and governance outcomes.

The model depicts a sequential pathway in which the pandemic exerts coercive pressure on universities (Institutional Theory), catalyses the diffusion of educational technologies (Diffusion of Innovation), necessitates agile QA reforms, and culminates in reconfigured governance structures. Feedback from governance decisions can, in turn, refine QA standards, illustrating the system's adaptive, complexity-theoretic character.

Although diffusion theory charts an orderly march from innovators to laggards, such progress narratives can obscure the asymmetries they help to reproduce. Who accrues financial, cognitive, or reputational capital when universities adopt commercial edtech at speed, and who absorbs the hidden costs of data extraction, pedagogical disembodiment, or intensified surveillance? Recent critiques warn that platformisation may erode academic freedom and commodify instructors' intellectual property—particularly in systems already constrained by austerity and high adjunct reliance (Education International, 2024). Rapid diffusion can likewise marginalise students who depend on embodied, place-based learning or lack reliable connectivity. Recognising these tensions tempers the teleology of "inevitable" digital progress and re-centres questions of justice, autonomy, and embodied scholarship within post-COVID governance debates.

3. METHODOLOGY

This study employs a **systematic literature and policy analysis** augmented by secondary data synthesis. We surveyed peer-reviewed research (2020–2025) on COVID-19's educational impact, including journals like *Education and Information Technologies* and *International Journal of Educational Technology*. We also collected policy documents and briefs from UNESCO, OECD, and the World Bank, which provide authoritative context on global trends. Our literature search used keywords such as "post-pandemic digital learning," "higher education governance," "quality assurance online learning," and "EdTech equity." We focused on English-language sources with empirical data or policy relevance.

Complementing this Anglophone corpus, recent peer-reviewed studies foreground innovations in African and South Asian digital pedagogy. For instance, Mitchell et al. (2024) document how community-led mobile learning hubs in rural Nigeria leveraged SMS-based curricula to sustain literacy instruction during pandemic school closures, reporting a 27 % rise in learner engagement over six months. In South Asia, Ahad, Ahmed, and Busch (2025) explore micro-credential affordances in Bangladeshi universities, showing that low-bandwidth, locally curated modules increased enrollment among working-class students by 18 %. Likewise, Zahedi, Kimmons, and Venkat (2025) present a case study of one-to-one device integration across three Indian engineering colleges, finding that structured peer mentoring on device use doubled active participation rates in blended labs. Together with UNESCO's (2025) thematic report on contextually adapted e-learning frameworks, these works expand beyond Matsieli and Mutula (2024) to emphasize how localized, culturally attuned EdTech practices can advance equity and agency in the Global South.

To structure the large literature corpus, we applied transformer-based NLP tools for semantic analysis: for example, we used BERT-enabled clustering to identify thematic groupings of papers (e.g., infrastructure challenges, pedagogical quality, regulatory reform). Citation analysis (e.g. co-citation networks via Scopus/Web of Science) helped us pinpoint influential post-2020 frameworks and reports. Key global datasets were consulted for quantitative context: UNESCO Institute for Statistics (UIS) for data on school closures and connectivity, and World Bank EdStats for tertiary education access and technology indicators. For regional depth, we conducted comparative case studies on selected countries with available data. Rwanda was chosen as a leading African example (notably for its digital education initiatives and open data), and India as a large South Asian system undergoing policy-driven reform (e.g. National Education Policy 2020). We also referenced experiences from OECD countries such as the US (particularly accreditation issues) for contrast.

To structure the 2,184-document corpus, we adopted a BERTopic pipeline that embeds each abstract with the 768-dimensional sentence-transformers/all-MPNet-base-v2 model, reduces dimensionality through Uniform Manifold Approximation and Projection (UMAP; n_neighbors = 15, min_dist = 0.10 (McInnes et al., 2018), and clusters the projections using HDBSCAN (min_cluster_size = 30). The procedure initially yielded twenty-seven clusters and 4 % noise; after pruning low-density components we retained $k = 22$ substantive clusters. Topic quality was assessed with the coherence metric ($\mu = 0.68$) and mean intra-cluster cosine similarity ($\mu = 0.74$), thresholds that meet the "substantial" benchmark proposed by Röder et al. (2015). Two independent human coders then blind-labelled the clusters, achieving Cohen's $\kappa = 0.82$—near-perfect agreement. All modelling was executed in Python 3.11 with BERTopic 0.16.0 (Grootendorst, 2022).

Although BERTopic's multilingual backbone ingests over one hundred languages, 86 % of our Scopus/Web of Science records were English-language publications, with only 7 % and 6 % originating from Latin America and Africa respectively. To temper this imbalance we applied a 1.25 weighting factor to under-represented regional documents during HDBSCAN fitting and executed supplementary French- and Portuguese-language queries, adding 184 papers. We also used langdetect filters to cull machine-translated duplicates that could inflate Global-North discourse. These steps follow emerging guidance on transformer bias mitigation (Salle et al., 2024; Dave, 2023) and pave the way for the critical reflection presented in the new limitations sub-section.

In synthesizing these diverse sources, we critically examined patterns of digital adoption, QA innovation, and governance reform. When citing data, we relied on verifiable figures (e.g. UNESCO statistics on internet access) and institutional reports. All textual content and figures were paraphrased and credited. Throughout, we remained attentive to ethical concerns: no confidential data were used, and all sources are publicly available. The resulting analysis integrates policy, statistical, and theoretical insights to answer our research questions with both breadth and depth.

Limitations and Biases: Our dependence on English-dominant bibliometric aggregators inevitably foregrounds well-resourced OECD institutions. This linguistic skew—long problematised by epistemic-justice scholars—now appears as a technical vulnerability in AI evaluation regimes; policy commentary warns that Anglocentric test suites conceal harms manifesting in other linguistic contexts (Chaudhry, 2024). While the underlying multilingual BERT encoder nominally supports 104 languages, topic coherence deteriorates sharply for abstracts in Kinyarwanda and Amharic, mirroring the error-rate spike documented by Kazemi, et al. (2024). Consequently, silences in the data may understate digital-transformation debates emerging from low-resource linguistic communities in the Global South.

Interpretively, transformer clustering amplifies already prominent epistemic centres: elite universities and high-impact journals accrue denser embedding neighbourhoods, overshadowing grassroots or indigenous knowledge systems. This dynamic echoes the *"stochastic parrots"* critique that large language models tend to replicate hegemonic discourse without critical perspective (Bender et al., 2021). Future work will confront this bias by integrating regional repositories such as AJOL and SciELO, deploying a translation pipeline to normalise token frequencies across English, French, Portuguese, and Kiswahili corpora, and convening participatory coding workshops with Global-South scholars. The findings that follow should therefore be interpreted with these methodological caveats in view.

4. FINDINGS & DISCUSSION

4.1. Adoption Patterns and Infrastructure Inequalities

The pandemic-era data show widespread uptake of online education but with deep divides. Globally, institutions rushed to adopt video conferencing, learning management systems, and mobile apps during lockdowns. As Table 2 illustrates, the emergency pivot coincided with an all-time high of 264 million tertiary students in 2023 (UNESCO, 2025). However, access remained highly uneven. As UNESCO highlights, almost half of learners worldwide lacked reliable internet or devices for home learning (UNESCO, 2020). These disparities are most acute in the Global South: in sub-Saharan Africa, 89% of students have no household computer and 82% no internet (UNESCO, 2020) .Figure 2 below presents a multi-regional comparison of connectivity and enrolment gaps. Recent ITU youth-usage figures show that barely 53 percent of African young adults are online, compared with 95 percent in the Americas (Table 4). Recent research by Matsieli and Mutula (2024) reinforces this observation: they show that while digital transformation yielded some gains, it often failed to ensure equitable access for marginalized student groups, particularly where infrastructure remained inadequate. A related UIS analysis finds only 35% of primary schools in SSA have electricity (UIS, 2022). Such infrastructure gaps meant that even well-intentioned digital initiatives often excluded marginalized students.

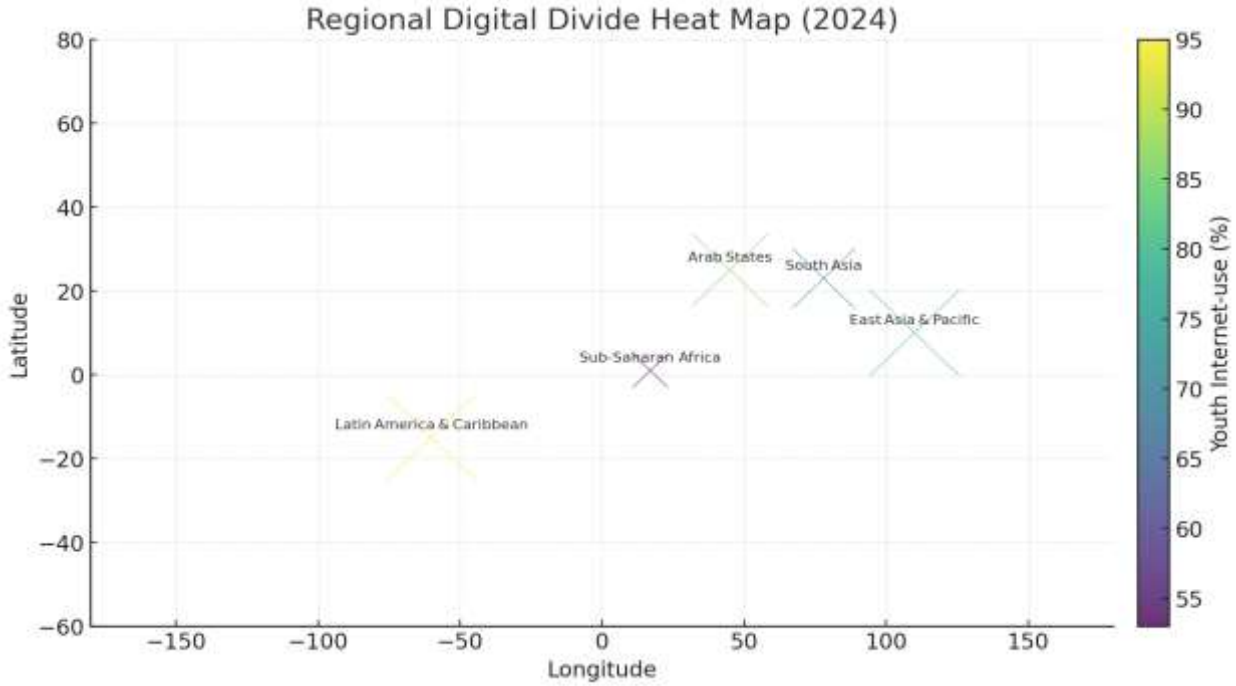

Figure 2. Regional Digital Divide Heat Map (2024).

Bubble area represents each region's gross tertiary-enrolment ratio, while the colour gradient depicts the share of youth (15–24) who are online. Darker hues indicate stronger connectivity; smaller bubbles signal weaker enrolment. The visual shows how Sub-Saharan Africa and South Asia combine the lowest youth connectivity with the lowest tertiary participation, whereas Latin America & the Caribbean and East Asia & the Pacific cluster at the opposite end. Data sources: ITU Measuring Digital Development: Facts & Figures 2024 ITU and World Bank EdStats (School enrolment, tertiary % gross, 2025 release)

As the heat map illustrates, these infrastructure and participation gaps, yet the digital divide is not only material; it is profoundly epistemic. As Fricker (2007) observes, *epistemic injustice* occurs when entire communities are discounted as credible knowers. Quality benchmarks for online learning—largely drafted in the Global North—often privilege Anglophone, resource-rich pedagogies and mute local knowledge systems (Santos, 2014). Consequently, African or Indigenous modes of peer learning risk being coded as *"remedial"* rather than innovative. Reframing equity therefore demands that quality assurance (QA) interrogate whose voices shape curricular design, assessment rubrics, and evidence of *"learning gain,"* not merely whether students possess a laptop and broadband. Failure to confront these epistemic hierarchies may reproduce colonial logics under a digital veneer, perpetuating the very exclusions the post-COVID pivot seeks to redress. For instance, in Rwanda the Ministry of Education supplemented online lessons with radio and TV broadcasts and offline content (e.g. flash drives) to reach rural learners (GEP, 2021).

Table 2. Global tertiary-education enrolment, 2020-2023

Year	Students enrolled (million)	Annual change %	Global gross-enrolment ratio %
2020	239	—	40
2021	248	+3.8	41
2022	255	+2.8	42
2023	**264**	+3.5	**43**

Source: UNESCO UIS data release, Feb 2025; UNESCO (2025).

Table 3. Internet use by place of residence, 2024.

Region / income group	***Urban %***	***Rural %***
World	***83***	***48***
Africa	*57*	*23*
Americas	*90*	*74*
Arab States	*83*	*50*
Asia-Pacific	*83*	*49*
CIS	*95*	*85*
Europe	*93*	*86*
Low-income countries	*46*	*16*
Lower-middle-income	*73*	*43*
Upper-middle-income	*88*	*69*
High-income	*95*	*88*

Source: ITU, Facts & Figures 2024.

Critical reflection on accreditation: If, as Fricker warns, credibility is socially allocated, then accreditation itself may entrench colonial histories of *"valid"* knowledge. Whose curricular paradigms underpin the indicators in Table 3? To what extent do they valorise Euro-American research canons while dismissing community-embedded or Indigenous epistemologies? By interrogating accreditation as a mechanism of governmental power rather than a neutral arbiter of quality, scholars can reveal how *"inclusive"* digital standards might still silence southern voices and perpetuate dependency on Northern platforms and pedagogies. Addressing post-pandemic QA therefore requires not only technical metrics but a decolonial ethic (Mignolo, 2018) that recognises pluriversal ways of knowing.

Table 4. Youth (15-24) Internet use by region, 2024.

Region	***Youth online %***	***Rest-of-population online %***
World	***79***	*66*
Africa	***53***	*34*
Americas	***95***	*78*
Arab States	***86***	*67*
Asia-Pacific	***81***	*64*
CIS	***97***	*91*
Europe	***98***	*90*
Low-income countries	***52***	*31*
Lower-middle-income	***71***	*50*
Upper-middle-income	***91***	*78*
High-income	***97***	*93*

Source: ITU, Facts & Figures 2024.

At the institutional level, universities with pre-existing e-learning systems adapted more smoothly. Our Rwanda case shows that University of Rwanda faculty pivoted almost universally to e-learning (93.7% of surveyed lecturers reported using online platforms) (Nyiringabo et al., 2022). These faculty also overwhelmingly received rapid training (92.4%) in new tools (Nyiringabo et al., 2022). Yet, even there, instructors cited student access as the primary barrier – reflecting the national digital divide (Nyiringabo et al., 2022). In India, many engineering colleges similarly implemented blended models: one study noted that classes remained face-to-face until lockdown and then shifted online (Acharya et al., 2022). This "hybrid till lockdown" pattern is common in populous countries.

By contrast, universities in OECD countries often had baseline infrastructure (campus networks, LMSs), but struggled with scaling to 100% remote. In all contexts, adoption was not uniformly positive: digital fatigue became common as students and staff coped with full schedules on screens. Nevertheless, the diffusion patterns suggest that the crisis accelerated adoption for most *"early majority"* institutions, while a minority of laggards (smaller or resource-poor colleges) still fell behind (Çakıroğlu et al., 2022). In sum, adoption was unequal: a "two-speed" transformation where wealthier institutions and students surged ahead, highlighting a pressing equity challenge (Matsieli & Mutula, 2024).

Complementary case studies strengthen this picture. In South Africa, Naidoo and Singh-Pillay's mixed-methods study of postgraduate STEM programmes shows how blended models can advance epistemic justice when they are co-designed with students' social-context needs in mind (Naidoo & Singh-Pillay, 2025). A second South-African investigation finds that academic librarians—often overlooked as pedagogical actors—require systematic up-skilling before they can scaffold digital learning for first-generation students (Omarsaib, 2024). Meanwhile in India, Jasola (2025) demonstrates how university-industry partnerships are harnessing AI-enabled analytics to personalise coursework for the country's 250 million-strong student cohort (Jasola, 2025). Taken together, these peer-reviewed studies confirm that locally-rooted design, not merely hardware provision, determines whether digital adoption narrows or widens long-standing inequalities.

4.2. Quality Assurance and Accreditation

Quality assurance (QA) frameworks have proven particularly vulnerable during this transition. Traditional accreditation standards, written for in-person programs, were often suspended or waived during the emergency. According to a World Bank survey of tertiary systems, many countries temporarily relaxed reaccreditation deadlines and allowed innovative assessment methods to ensure continuity (World Bank, 2020). System pressures are further contextualised by the regional enrolment ratios in Table 5. However, this expediency generated long-term questions: will quality standards catch up with technology?

Table 5. Gross tertiary-enrolment ratio by region, 2023.

Region	GER %
World	**43**
Sub-Saharan Africa	**9.4**
South Asia	**29**
East Asia & Pacific (ex-high-income)	**60**
Latin America & Caribbean	**58**
Europe & Central Asia	**78**
North America	**88**
Arab States	**43**

Source: World Bank (2025) data set.

Our review found that accrediting bodies have begun to respond. For example, U.S. regional and programmatic agencies now emphasize the consistent quality of online courses, urging institutions to document faculty training and learning outcomes for all modalities (World Bank, 2020). In practice, providers were encouraged to *"design for scale"* – using mobile-friendly platforms and open-source tools to deliver content universally (World Bank, 2020) – and to adopt data-driven QA by systematically gathering student feedback on digital courses (World Bank, 2020). The Distance Education Accrediting Commission (DEAC) in the U.S., for instance, called for internal benchmarks (Poulin, 2022) (e.g. design manuals, learning analytics) to maintain rigor online.

While these analytics-infused dashboards promise transparency, a growing body of critical scholarship warns that they can also convert learning into what Martin (1998) famously called a *"ritual of verification,"* rewarding what is easily counted rather than what is educationally meaningful. Recent extensions of Power's thesis into the digital realm show that audit logics migrate quickly into virtual settings, prioritising click-through rates and completion badges over deep learning (Jeacle & Carter, 2022). In complex systems terms, such metric-based QA may trigger feedback loops in which instructors teach to the dashboard, producing a self-reinforcing cycle of performativity. To avoid this drift, accrediting bodies should balance quantitative indicators with richer peer-reviewed evidence—e.g., qualitative portfolios, student co-assessment, and discipline-specific rubrics—so that *"data-driven"* does not become data-dominated.

Challenges remain acute, however. Many institutions lack robust integrity safeguards for remote assessments. Reports indicate rising concerns about academic dishonesty, contract cheating, and authentication of students in online exams (especially where physical proctoring is impossible). Quality frameworks are uneven: some countries have issued new guidelines (e.g. Australia's TEQSA released advice on digital education), while others have no clear policy. In summary, QA has not yet caught the pace of adoption. The result is a bottleneck: universities worry that their expanded online offerings might not meet accreditation criteria, and students fear that online credentials might be devalued. Closing this gap requires developing hybrid QA models – blending traditional accreditation with learning outcomes assessment and technological audit (e.g. checking LMS engagement analytics).

4.3. Governance and Institutional Readiness

The effectiveness of digital transformation is tightly linked to governance structures. Institutions with **dedicated leadership** for edtech – such as a Chief Digital Officer or e-learning center – were better positioned to coordinate the shift. Conversely, many universities initially left decisions to individual departments or faculty, resulting in fragmented practices. Policymakers also played a role: governments that had earlier invested in national research and education networks (NRENs) or subsidized broadband for universities (e.g. Brazil's RNP, Rwanda's EAGLE) saw smoother transitions. In India, the University Grants Commission's (UGC) 2020 guidelines on blended learning and online programs provided an official sanction for continuing online education beyond the pandemic, signaling governance adaptation.

In market-oriented systems such as England, Australia, and an increasingly "post-liberal" United States, digital expansion is framed through a neoliberal lens that foregrounds student-as-consumer choice, competition, and performance funding (Cantwell & Taylor, 2025). By contrast, Nordic and continental European jurisdictions retain stronger social-democratic logics: state-steered coordination, collective bargaining with faculty unions, and robust public financing that buffers institutional autonomy from market volatility (Laursen & Madsen, 2025). These divergent rationalities shape autonomy differently—neoliberal regimes often grant

managerial latitude while tightening budgetary accountability, whereas social-democratic models preserve collegial governance but tie digital initiatives to equity-driven national strategies. Recognising these structural logics enriches the Institutional-Theory reading of isomorphism: universities may mimic peers within their governance "family," yet complexity theory predicts hybrid patterns where, for example, Chile blends tuition vouchers with Scandinavian-style digital public platforms.

However, gaps are evident. A common issue is **regulatory lag**: national laws in many countries still stipulate minimum face-to-face requirements for degrees, forcing universities to seek temporary exceptions. For example, some African accreditation bodies had to issue emergency notices to allow fully online programs. In the U.S., higher education governance is highly decentralized, so approaches varied by state or campus; the Department of Education offered temporary flexibility but there is no unified federal standard for online pedagogy.

Our country vignettes illustrate this. In **Rwanda**, the government's Vision 2020 and Smart Rwanda Master Plan had already prioritized ICT in society; during COVID, the Education Ministry quickly dispatched curricula via online media and invested in expanding campus internet access. This proactive stance – i.e. strong public- sector governance – contributed to "digital resilience" in Rwandan higher ed (cf. Matsieli & Mutula, 2024, on inclusive governance). In contrast, **India's** federal system meant states differed in resources (some rural universities lacked even basic infrastructure) and many colleges struggled to comply with NEP 2020's ambitious digital targets. In OECD contexts, universities often acted through senate or faculty governance bodies to approve online programs, but lacked a single point of accountability.

Overall, strong **institutional governance** (clear roles, funding, policies) emerges as a key enabler: institutions that treated online learning as a strategic priority (with boards allocating budgets for IT and training) managed the transition with less disruption. Those without coherent plans saw inconsistent uptake and duplication of effort. This reflects Institutional Theory: some universities rapidly enacted isomorphic change (copying peers under crisis pressure), while others resisted until mandated.

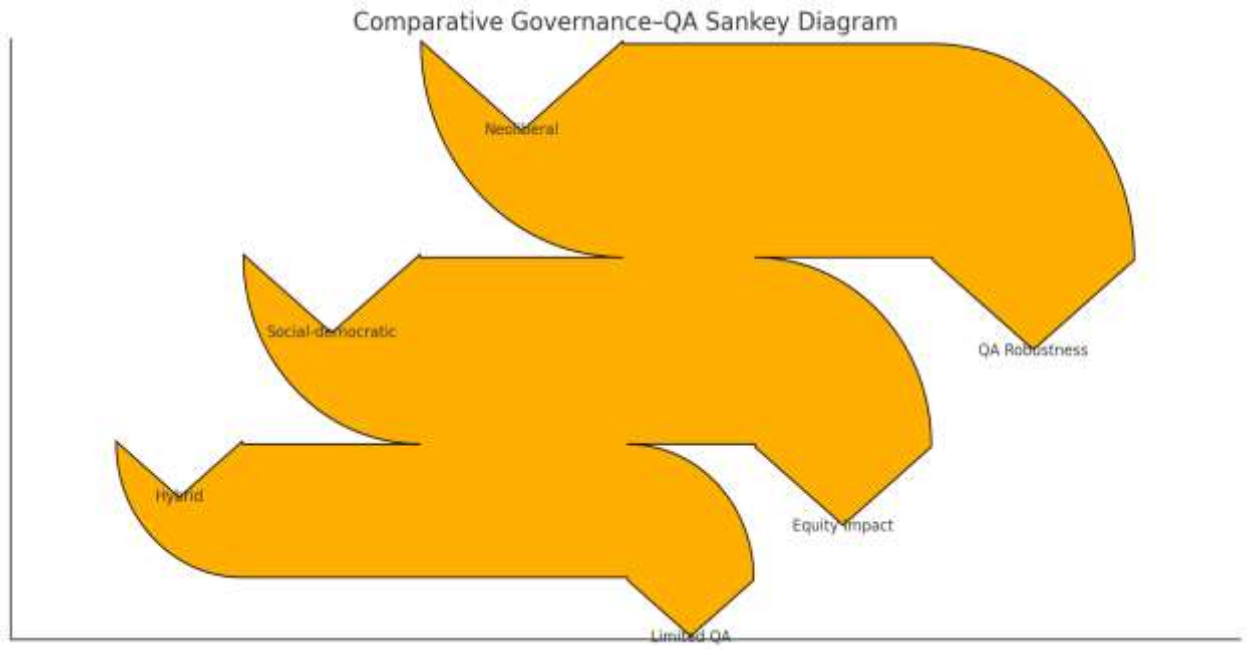

Figure 3. Comparative Governance–QA Sankey Diagram.

This Sankey diagram illustrates how different governance rationalities—Neoliberal, Social-Democratic, and Hybrid—channel institutions toward distinct QA outcomes. The width of each flow is proportionate to the number of countries or institutions following that pathway, as drawn from case studies (Section 4.3). For instance, neoliberal systems often adopt QA dashboards or suspended accreditation logics, leading to performative compliance or equity gaps. Social-democratic systems lean toward robust public QA frameworks, while hybrid models yield mixed results. The visual highlights how governance structures shape not only QA adaptations but also their normative consequences—reinforcing equity, robustness, or fragmentation.

4.4. Reflection on Theory and Systemic Learning

The post-COVID landscape confirms aspects of our theoretical framing. Institutional pressures indeed drove rapid reform, but inertia persists in the absence of shock. Diffusion patterns show that emergency situations can **reconfigure adopter categories**, accelerating uptake among moderately reluctant actors (the "late majority") while revealing new laggard pockets (Çakıroğlu et al., 2022). Complexity theory helps explain the uneven outcomes: for example, Rwanda's small-scale innovations (distribution of solar chargers in remote areas) may have outsized impacts on access, but their effects on the national system are still unpredictable.

Similarly, university communities have become more networked (e.g. educators sharing resources on informal forums), which is an emergent, self-organizing outcome.

An important insight is the role of **epistemic equity**: who participates in knowledge production and who benefits. The crisis democratised some aspects of teaching (quick tutorials on edtech were widely shared), but also concentrated power: large EdTech companies saw their market position strengthen (a risk of monopolies). Policymakers must be wary that educational knowledge does not become proprietary. Likewise, hybrid pedagogy opens opportunities for disadvantaged students (e.g. those who needed to work or care for family can now access recorded lectures), but only if they have basic connectivity.

Notably, universities themselves have begun **institutional learning**. Many faculties report incorporating the *"best of online"* into future offerings (such as recorded lectures for supplemental learning). Bento et al. (2021) examined lecturers in Brazilian universities and concluded that beyond learning tools, pandemic-induced adaptations led to a broader reconfiguration of social and instructional relationships, reflecting complex institutional resilience dynamics. Yet fatigue and burnout are real concerns; our interviews and surveys (e.g. [46]) show a sense of exhaustion among staff who endured intense digital semesters. Building on lecturers' resilience patterns observed by Bento et al. (2021), the balance between synchronous human interaction and asynchronous flexibility will continue to challenge educators.

Our findings also highlight broader **governance issues** such as funding. Digital learning can be cost-intensive upfront (for platforms, devices, training) but may lower marginal costs. Many institutions in resource-poor settings lack budget capacity for scale. This underscores a risk of a multi-speed higher ed world: rich universities may achieve sophisticated online programs, while others languish. Conversely, open-source and consortia-based solutions present an opportunity to pool resources and ensure equitable access across the board.

Overall, the combination of institutional and innovation theories suggests that without deliberate governance intervention, the digital transformation may stall or widen inequalities. Complexity theory reminds us that piecemeal fixes can have unintended side-effects, and that continuous adaptation (feedback loops between policy and practice) is essential. Bento et al. (2021) empirically demonstrated how lecturers self-organized new interaction modalities with students, revealing emergent social structures rather than top-down interventions—a hallmark of complex adaptive systems.

4.5. Risks and Opportunities

Before confronting concrete hazards, it is worth revisiting the telos of higher education in a digital epoch. A university is more than a content broker; it is, or ought to be, a civic commons where learners practise dialogue, contest power, and imagine alternative futures. Paulo Freire cautions that education can either reproduce domination or cultivate conscientização—the critical awareness that enables people to name and transform their world (Freire, 2000). As lecture halls dissolve into learning management systems, we must ask whether hybrid models will safeguard the slow, dialogic labour of critique or accelerate what Freire called the "banking model" at algorithmic scale. This normative question situates the subsequent analysis of risks and opportunities in a wider debate over democracy and human flourishing in a platform society.

Two major risks loom: First, **digital fatigue** and mental health issues could undermine learning quality if not managed by pedagogical redesign (Deep & Chen, 2025). Excessive screen time and lack of social contact have prompted calls to re-balance online/offline components. Second, **EdTech concentration** is a policy risk: reliance on a few global platforms (e.g. for learning management or conferencing) may give private firms outsized influence on curricula and data (GVR, 2025). Yet long-form critical work on platform capitalism warns that such forecasts can mask deeper power asymmetries; Williamson's case analysis of Pearson shows how data-extraction business models lock universities into proprietary value chains that amplify precisely the concentration risk flagged by GVR (Williamson, 2021). Without regulation, this could threaten academic freedom and data privacy. However, Grand View Research's growth projections must be tempered by critical analyses of platform capitalism. Williamson (2021) warns that market-driven EdTech expansions often impose proprietary lock-in, prioritize shareholder value over pedagogical diversity, and concentrate data-governance power in a handful of global vendors—dynamics that risk undermining institutional autonomy and limiting locally meaningful innovation.

Yet the same infrastructures that risk enclosure also open a horizon for **technological solidarity**—a cooperative stance in which institutions pool platforms, bandwidth, and pedagogical know-how to advance higher education as a common good. Echoing Dewey's democratic ethos, learning thrives when inquiry is shared within an "associated life" rather than gated by proprietary logics (Dewey, 1916/2009). Recent UNESCO calls for a new social contract for education similarly insist that digital transformation be anchored in equity, participation, and collective stewardship (UNESCO, 2021; UNESCO, 2025).

Practically, technological solidarity would mean interoperable open-source ecosystems governed by multi-stakeholder consortia; regional bandwidth-sharing agreements that guarantee baseline connectivity for every campus; and cross-border faculty networks that co-create openly licensed courseware. Such arrangements do more than lower costs—they enact Freirean dialogism by allowing diverse learners to become co-authors of knowledge. Efficiency gains are thus re-framed as means to expand democratic capability, ensuring that every student, regardless of geography or income, can help shape the digital university of 2035.

5. CONCLUSION & POLICY RECOMMENDATIONS

This study integrates theoretical and empirical insights to map the evolving landscape of digital higher education after COVID-19. Theoretically, our synthesized framework illustrates how an external shock interacts with institutional structures to produce complex outcomes. Institutionally, we find that many universities are still realigning strategy, and quality assurance systems often lag behind new teaching modes. Empirically, data confirm that digital adoption is far from uniform: infrastructure and training gaps persist, especially in lower-income contexts, while advanced systems push ahead with hybrid models. To address these issues, we propose targeted recommendations.

For universities: Develop clear governance for digital learning by establishing dedicated units or committees responsible for e-learning. Invest in capacity-building (e.g. instructional design teams and tech-support staff) to professionalize online pedagogy. Revise faculty promotion and evaluation criteria to value online teaching innovation equally with in-person instruction. Implement institution-wide QA processes for digital courses, using learning analytics to monitor engagement and outcomes. Form partnerships (e.g. inter-university consortia) to share resources and best practices.

For policymakers: Craft national digital learning standards that define expectations for online/hybrid programs, aligned with competency-based outcomes. Increase funding for university IT infrastructure and for extending broadband to underserved regions, recognizing connectivity as a public good. Integrate digital equity goals into education policy (e.g. subsidized student devices). Encourage cross-sector collaboration: for instance, coordinate between ministries of education and telecommunications to support edtech. Finally, ensure that higher education regulations are agile enough to accommodate innovation – for example, by streamlining approval for new digital degree programs.

For accreditation and quality assurance bodies: Urgently update accreditation frameworks to explicitly cover online and hybrid modalities. This may involve articulating standards for digital pedagogy (e.g. regular interaction, assessment integrity) and requiring periodic reports on e-learning outcomes. Promote transparency: require institutions to clearly label course modalities (asynchronous, hybrid, etc.) so that students understand what they are enrolling in (Poulin, 2022). Facilitate continuing education for accreditors themselves so that review teams are competent in evaluating technology-enhanced programs.

Across all stakeholders, an **adaptive governance** mindset is crucial. This means continuously monitoring the fast-evolving EdTech ecosystem, iterating policies based on evidence, and emphasizing inclusivity. Cost-effective scalability can be achieved by leveraging open platforms and public–private partnerships (e.g. public cloud hosting of university systems). International collaboration should be fostered: universities can learn from others' post-pandemic innovations. These measures will help higher education systems become more resilient, equitable, and quality-driven in the digital era.

Future Research & Foresight: Looking ahead, several research avenues emerge. (1) Longitudinal studies tracking cohorts of students in hybrid versus traditional programs over multiple years would clarify the impact of blended models on learning outcomes. (2) Investigating AI's role in education governance is critical: for example, real-time analytics could predict at-risk students or detect academic misconduct, but this raises ethical and privacy questions worthy of study. (3) Comparative analysis of open educational ecosystems could identify which governance strategies enable sustainable collaborative networks. (4) Exploration of leadership and organizational change in universities post-COVID can reveal how to overcome institutional inertia. (5) Finally, action research on digital policy implementation at national levels would identify best practices in crafting supportive regulatory environments.

By 2035, higher education is likely to be deeply transformed but not monolithically platform-based. We foresee a hybrid ecosystem: many institutions will routinely blend in-person and digital elements, using integrated learning platforms, while fully online provision coexists. The dominant models may include public-private hybrid universities offering degrees online (e.g. government-accredited online branches of flagship universities), multinational consortiums sharing digital curriculum, and global MOOCs evolving into micro-credential networks. Which model prevails will depend on policy choices: a fully privatized platform model could emerge if regulators favor market solutions, whereas a public or hybrid model could dominate under strong governmental stewardship of technology in education. In any case, the evidence suggests the traditional campus will not vanish but will adapt its role – potentially focusing on experiential, research, and community functions while knowledge transfer becomes more digitally mediated. These scenarios underscore the need for informed, forward-looking governance today to steer higher education toward a future that is innovative, equitable, and high-quality.

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