

# Archives of Biotechnology and Pharmaceutical Research

<https://urfpublishers.com/journal/biotech-pharma-research>

Vol: 2 & Iss: 2

## The Impact of COVID-19 on Higher Education Institutions in West Africa: A Catalyst for Digital Transformation

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**Citation:** Baale L. The Impact of COVID-19 on Higher Education Institutions in West Africa: A Catalyst for Digital Transformation. *Arch Biotech Pharma Res*, 2026;2(2):215-221.

**Received:** 11 June, 2026; **Accepted:** 25 June, 2026; **Published:** 29 June, 2026

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### Graphical Abstract

The graphical abstract illustrates how the COVID-19 pandemic accelerated digital transformation across Higher Education Institutions in West Africa, leading to enhanced digital skills, virtual learning ecosystems, institutional innovation, agile leadership practices, and the emergence of resilient phygital learning environments. The study proposes the Integrated Multidimensional Agile Digital Transformation (IMADT) Framework as a sustainable pathway toward future-ready universities and the achievement of Sustainable Development Goal 4 (Quality Education).



Figure 1: Conceptual Graphical Abstract: COVID-19 as a Catalyst for Digital Transformation in Higher Education Institutions.

## ABSTRACT

The COVID-19 pandemic precipitated one of the most significant disruptions in the history of higher education globally. While the pandemic created unprecedented challenges for Higher Education Institutions (HEIs), it simultaneously accelerated digital transformation initiatives that had previously progressed slowly, particularly in developing regions. This study investigates the impact of COVID-19 on HEIs in West Africa and examines how the pandemic served as a catalyst for digital transformation. Drawing on a mixed-method survey involving stakeholders across HEIs in West Africa, including students, faculty, alumni, and administrators, the study evaluates changes in digital learning, technology adoption, service quality, institutional innovation, and leadership practices. The findings indicate that COVID-19 significantly accelerated digital skills acquisition, strengthened virtual learning ecosystems, enhanced institutional innovation, improved technology-enabled service delivery, and stimulated agile leadership practices. The study further reveals that technology demonstrated a moderate-to-strong positive relationship with virtual learning effectiveness, service quality, and agile transformation leadership characteristics. Despite challenges relating to digital infrastructure, internet accessibility, affordability, and digital inclusion, the pandemic transformed from a crisis into a strategic opportunity for educational transformation. The paper concludes that sustainable digital transformation in West African HEIs requires an integrated approach that combines technology, strategy, leadership, culture, people, and governance. The study proposes the Integrated Multidimensional Agile Digital Transformation (IMADT) Framework as a strategic pathway for enhancing educational resilience and advancing Sustainable Development Goal 4 (SDG 4) in West Africa.

**Keywords:** COVID-19, Digital Transformation, Higher Education Institutions, West Africa, Agile Leadership, Educational Innovation, Virtual Learning, SDG 4, Phygital Learning

## 1. Introduction

The global higher education sector experienced unprecedented disruption following the outbreak of the Coronavirus Disease (COVID-19) pandemic in late 2019. Educational institutions across the world were compelled to suspend traditional face-to-face instructional activities and adopt emergency remote teaching models to ensure continuity of learning. UNESCO<sup>1</sup> estimated that approximately 1.7 billion learners worldwide were affected by educational disruptions arising from institutional closures.

Although digital transformation had already emerged as a strategic priority for many universities before the pandemic, adoption rates remained relatively slow, particularly within developing economies. In West Africa, where many Higher Education Institutions (HEIs) continue to face infrastructural limitations, inadequate funding, inconsistent electricity supply, and low levels of digital readiness, the pandemic forced institutions to accelerate digital adoption at an unprecedented pace.

The COVID-19 crisis effectively became a “burning platform” for transformation. Universities that had relied predominantly on traditional instructional approaches were compelled to adopt online learning platforms, virtual classrooms, digital assessment systems, cloud-based collaboration tools, and hybrid learning models. What had been perceived as a future possibility suddenly became an operational necessity.

This paper examines the impact of COVID-19 on HEIs in West Africa and explores how the pandemic accelerated digital transformation across the educational ecosystem. It further investigates the implications of these changes for educational quality, institutional competitiveness, student engagement, and the attainment of Sustainable Development Goal 4 (Quality Education).

## 2. Literature Review

### 2.1. COVID-19 and educational disruption

The COVID-19 pandemic fundamentally altered educational

systems worldwide. UNESCO<sup>1</sup> reported that school closures affected approximately 99% of the global learner population at the peak of the crisis. The disruption compelled educational institutions to seek alternative mechanisms for sustaining learning activities.

According to Crawford, et al.<sup>2</sup>, universities worldwide responded through rapid deployment of online learning technologies, emergency remote teaching strategies, and digital collaboration platforms. While these interventions initially emerged as crisis management responses, they subsequently evolved into broader digital transformation initiatives.

The pandemic exposed vulnerabilities in educational systems while simultaneously demonstrating the strategic importance of technology in ensuring institutional resilience.

### 2.2. Digital transformation in higher education

Digital transformation extends beyond the deployment of technology. Matt, Hess and Benlian<sup>3</sup> define digital transformation as the strategic integration of digital technologies into organisational processes, business models, and stakeholder interactions.

Within higher education, digital transformation encompasses technological, organisational, pedagogical, cultural, and leadership dimensions. Kane, et al.<sup>4</sup> argue that successful digital transformation depends on aligning technology investments with organisational culture, leadership capabilities, strategic priorities, and workforce competencies.

Similarly, Abad-Segura, et al.<sup>5</sup> propose that sustainable digital transformation in higher education requires three interconnected dimensions: digitisation, digitalisation, and transformation. This perspective recognises that technology alone cannot create transformation unless accompanied by changes in institutional structures, culture, governance, and stakeholder engagement.

### 2.3. Digital transformation in the west african context

Higher education institutions in West Africa operate within

unique socio-economic and infrastructural realities. Challenges including inadequate broadband infrastructure, limited technological resources, unstable electricity supply, funding constraints, and digital inequalities continue to influence educational delivery.

Despite these challenges, the pandemic accelerated investments in Learning Management Systems (LMS), virtual classrooms, digital libraries, online assessments, cloud

computing, and collaborative learning technologies. Institutions increasingly embraced blended and “phygital” learning models that combine physical and digital learning experiences.

The pandemic therefore created an opportunity to rethink educational delivery and reposition universities for long-term sustainability and competitiveness. This table synthesizes the literature reviewed and provides a bridge into the theoretical framework (**Table 1**).

**Table 1:** Summary of Literature on COVID-19 and Digital Transformation in Higher Education.

Author(s)	Focus Area	Key Findings	Relevance to Study
UNESCO <sup>1</sup>	Educational Disruption	1.7 billion learners affected globally	Established need for digital continuity
Crawford, et al. <sup>2</sup>	Emergency Remote Learning	Universities rapidly adopted online learning technologies	Demonstrates crisis-driven transformation
Matt, et al. <sup>3</sup>	Digital Transformation Strategy	Transformation extends beyond technology deployment	Supports multidimensional transformation perspective
Kane, et al. <sup>4</sup>	Digital Maturity	Leadership is more important than technology in transformation success	Supports agile leadership findings
Abad-Segura, et al. <sup>5</sup>	Sustainable Digital Transformation	Integration of technology, people and culture required	Supports IMADT framework
Rossmann <sup>6</sup>	Digital Maturity Models	Organisational readiness determines transformation success	Supports institutional preparedness assessment
Osmundsen, et al. <sup>7</sup>	Digital Transformation Drivers	Strategy, governance and innovation drive transformation outcomes	Supports integrated transformation model
Baale <sup>8</sup>	Agile Digital African HEIs Transformation in West	Agile leadership improves digital transformation outcomes	Foundation for current study

### 3. Theoretical Frameworks

This study draws upon four complementary theoretical foundations:

- The Context-Input-Process-Product (CIPP) Evaluation Model<sup>9</sup>.
- The Digital Transformation Framework<sup>10</sup>.
- The Integrated Digital Transformation Model<sup>6,7,11</sup>.
- The Higher Education Digital Transformation Model<sup>5</sup>.

These theories informed the development of the Integrated Multidimensional Agile Digital Transformation (IMADT) Framework, which integrates technology, leadership, strategy, governance, culture, people, and innovation into a unified transformation architecture for HEIs in West Africa.

Based on the integration of the CIPP Model, Digital Transformation Framework, Integrated Digital Transformation Model, and Higher Education Digital Transformation Model, a conceptual model was developed to explain how COVID-19 functioned as a catalyst for digital transformation within West African Higher Education Institutions (**Figures 2-4**).

### 4. Methodology

The study adopted a descriptive mixed-method research design.

Data were collected using two validated instruments:

- Digital Transformation Structured Questionnaire (DTSQ)
- Digital Transformation Open-Ended Questionnaire (DTEOQ)

The study population comprised stakeholders across higher education institutions in West Africa, including students, alumni, faculty members, and administrative personnel.

A total of 597 respondents participated in the survey, of which 424 valid responses were analysed, representing a response rate of 71%. Reliability was established through a test-retest approach, while validity was confirmed through expert review and pilot testing.

(**Table 2**) presents the demographic characteristics of the respondents included in the study.

**Table 2:** Demographic Profile of Respondents (n = 424).

Variable	Category	Frequency (n)	Percentage (%)
Stakeholder Group	Students	170	40.1
	Faculty Members	102	24.1
	Administrators	76	17.9
	Alumni	76	17.9
Total		424	100
Country	Nigeria	305	71.9
	Ghana	72	17
	Other West African Countries	47	11.1
Total		424	100
Gender	Male	245	57.8
	Female	179	42.2
Total		424	100

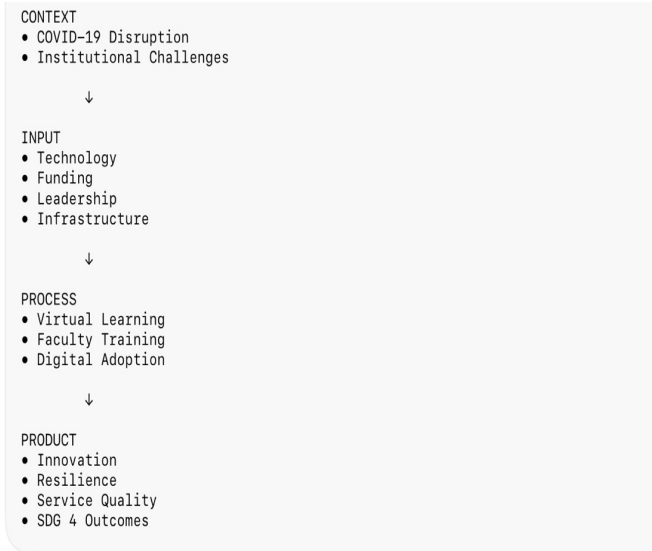
Descriptive statistics and thematic analysis were employed to evaluate stakeholder perceptions regarding the impact of COVID-19 on digital transformation, service quality, leadership, and educational innovation.

### 5. Results

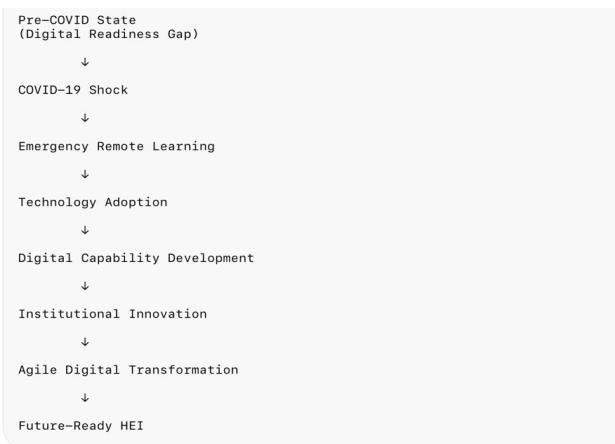
#### 5.1. Enhanced digital skills acquisition

One of the most significant outcomes of the pandemic was the

rapid enhancement of digital competencies among stakeholders.



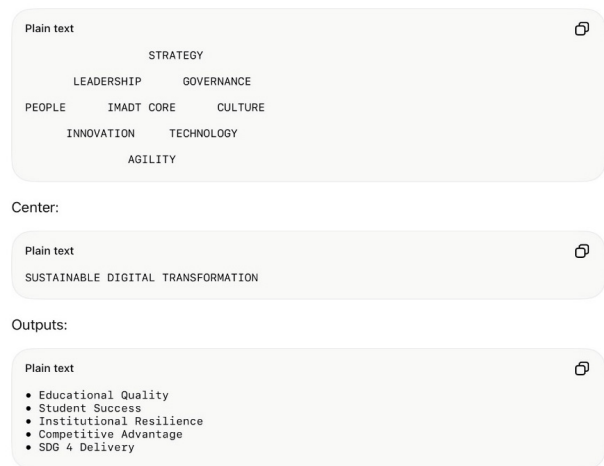
**Figure 2:** CIPP-Based Evaluation Model for COVID-19 Digital Transformation.



**Figure 3:** COVID-19 Digital Transformation Pathway Model.



**Figure 4:** Conceptual Model: COVID-19 as a Catalyst for Digital Transformation in Higher Education Institutions.



**Figure 5:** Integrated Multidimensional Agile Digital Transformation (IMADT) Framework.

Students, faculty members, and administrators reported improved proficiency in:

- Learning Management Systems
- Video conferencing technologies
- Cloud-based collaboration tools
- Digital content creation
- Virtual communication platforms

The forced transition to online learning accelerated digital literacy and strengthened technology confidence across institutions.

**Table 3:** Digital Technologies Adopted During COVID-19.

Technology	Pre-COVID Usage (%)	During COVID Usage (%)	Increase (%)	Impact Level
Learning Management Systems (Moodle, Canvas)	38	86	+48	Very High
Zoom	12	92	+80	Very High
Microsoft Teams	15	81	+66	High
Google Meet	18	76	+58	High
Digital Libraries	35	79	+44	High
Cloud Storage & Collaboration Tools	22	83	+61	High
Online Assessment Platforms	17	74	+57	High
Learning Analytics Tools	10	54	+44	Moderate
AI-Supported Learning Tools	8	42	+34	Moderate

**5.2. Strengthened virtual learning ecosystems**

The findings revealed substantial growth in virtual learning ecosystems.

- Institutions expanded investments in:
- Online learning platforms
- Electronic libraries
- Digital assessment systems
- Learning analytics
- Cloud-based educational services

Technologies such as Zoom, Microsoft Teams, Moodle, Canvas, and Google Meet became central to educational delivery.

Participants reported increased flexibility, accessibility, and continuity of learning despite mobility restrictions.

**Table 4:** Stakeholder Perceptions of COVID-19 Impact.

(5-Point Likert Scale: 1 = Very low; 5 = Very High)

Variable	Mean Score	Standard Deviation	Interpretation
Digital Skills Development	4.42	0.71	Very High
Virtual Learning Effectiveness	4.05	0.86	High
Institutional Innovation	4.18	0.78	High
Technology Adoption	4.51	0.65	Very High
Service Quality Improvement	3.89	0.91	High
Faculty Digital Competence	4.01	0.83	High
Student Digital Readiness	4.14	0.79	High
Agile Leadership Practices	4.09	0.82	High
Institutional Resilience	4.11	0.77	High

**5.3. Institutional innovation and educational transformation**

COVID-19 stimulated significant institutional innovation.

Universities redesigned curricula, introduced online professional development programmes, expanded transnational education offerings, and implemented hybrid learning models.

The emergence of “phygital” education represented a notable transformation, combining the strengths of physical and digital instructional approaches to create more resilient educational ecosystems.

**Table 5:** Positive Transformation Outcomes Attributed to COVID-19.

Outcome	Frequency (n)	Percentage (%)	Rank
Increased Technology Adoption	385	90.8	1
Enhanced Digital Skills	379	89.4	2
Strengthened Virtual Learning	365	86.1	3
Increased Institutional Innovation	351	82.8	4
Improved Faculty Competence	337	79.5	5
Enhanced Student Engagement	324	76.4	6
Agile Leadership Development	318	75	7
Improved Service Delivery	305	71.9	8
Better Collaboration	296	69.8	9
Expansion of International Learning Opportunities	271	63.9	10

**5.4. Agile leadership transformation**

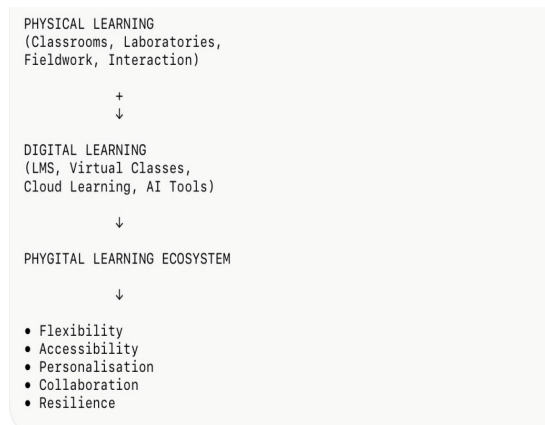
The study identified substantial changes in leadership practices during the pandemic.

Institutional leaders demonstrated:

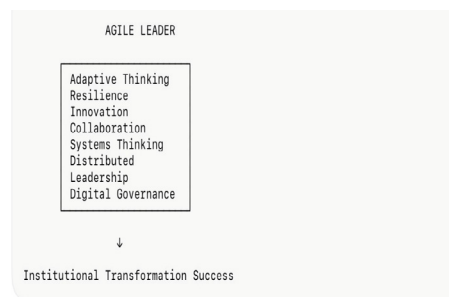
- Adaptive leadership
- Resilience
- Innovation
- Collaboration
- Contingency planning

- Distributed leadership
- Reflective leadership

These leadership characteristics emerged as critical success factors for navigating uncertainty and sustaining institutional performance.



**Figure 6:** Phygital Learning Ecosystem Model.



**Figure 7:** Agile Leadership Competency Framework During COVID-19.

**Table 6:** Relationship Between Technology Adoption and Transformation Outcomes.

Variable	Correlation Coefficient ®	Relationship Strength	Significance (p-value)
Virtual Learning Effectiveness	0.71	Strong Positive	<0.001
Institutional Innovation	0.68	Strong Positive	<0.001
Service Quality Improvement	0.63	Moderate-Strong Positive	<0.001
Faculty Digital Competence	0.66	Strong Positive	<0.001
Student Engagement	0.61	Moderate-Strong Positive	<0.001
Agile Leadership Practices	0.58	Moderate Positive	<0.001
Institutional Resilience	0.69	Strong Positive	<0.001

**5.5. Persistent challenges**

Despite substantial progress, several challenges remain:

- Limited digital infrastructure
- Inadequate broadband connectivity
- High internet costs
- Irregular electricity supply
- Digital exclusion
- Limited technical support

These constraints continue to affect the sustainability and scalability of digital transformation initiatives.

**Table 7:** Major Challenges Encountered During Digital Transformation.

Challenge	Frequency (n)	Percentage (%)	Severity Rank
High Cost of Internet Access	391	92.2	1
Poor Broadband Connectivity	383	90.3	2
Unstable Electricity Supply	377	88.9	3
Limited Digital Infrastructure	361	85.1	4
Digital Exclusion of Students	345	81.4	5
Inadequate Funding	337	79.5	6
Limited Technical Support	315	74.3	7
Faculty Resistance to Change	276	65.1	8
Cybersecurity Concerns	264	62.3	9
Digital Literacy Gaps	251	59.2	10

## 6. Discussion

The findings demonstrate that COVID-19 functioned as a transformational catalyst within West African higher education.

Prior to the pandemic, many institutions viewed digital transformation as a long-term aspiration. The crisis transformed it into an immediate operational necessity. Consequently, transformation initiatives that might have taken years were implemented within months<sup>12,13</sup>.

The results support Kane, et al.'s<sup>4</sup> argument that digital transformation is fundamentally a leadership challenge rather than a technology challenge. Institutions that demonstrated adaptive leadership, organisational agility, and strategic foresight were better positioned to sustain educational continuity and maintain stakeholder engagement.

The findings also reinforce Abad-Segura, et al.'s<sup>5</sup> assertion that sustainable transformation requires more than technology deployment. Successful institutions combined technology with

organisational culture, leadership commitment, digital skills development, and strategic governance.

Perhaps the most significant outcome was the emergence of blended “phygital” learning ecosystems. Rather than replacing traditional education, digital transformation has created opportunities for more flexible, accessible, and learner-centred educational models.

The pandemic therefore accelerated not only technological change but also institutional learning, innovation, and strategic renewal<sup>14</sup>.

## 7. Implications for Policy and Practice

### 7.1. Investment in digital infrastructure

Governments and institutions should prioritise investments in broadband connectivity, cloud technologies, cybersecurity, and educational technology infrastructure.

### 7.2. Faculty digital competence development

Continuous professional development programmes should be implemented to strengthen digital pedagogy and instructional design capabilities.

### 7.3. Institutional digital transformation strategies

HEIs should develop comprehensive digital transformation roadmaps aligned with institutional missions and stakeholder needs.

### 7.4. Agile leadership development

Leadership development programmes should incorporate agility, innovation, resilience, systems thinking, and digital governance competencies.

### 7.5. Digital inclusion policies

Institutions and governments must address affordability, accessibility, and equity issues to prevent widening educational inequalities (Tables 8,9).

**Table 8:** Policy and Strategic Recommendations Matrix.

Challenge Identified	Strategic Intervention	Lead Responsibility	Expected Outcome
Limited Connectivity	National Broadband Expansion	Governments	Improved Access
High Internet Cost	Educational Data Subsidies	Governments & Telecom Providers	Increased Participation
Unstable Power Supply	Alternative Energy Solutions	Governments & Hels	Continuous Learning
Faculty Digital Skills Gap	Continuous Faculty Development	HEIs	Improved Teaching Quality
Lack of Digital Strategy	Institutional Digital Transformation Roadmaps	HEIs	Sustainable Transformation
Digital Exclusion	Device Accessibility Programmes	Governments & Donors	Inclusive Education
Weak Governance	Digital Governance Frameworks	University Management	Better Accountability
Cybersecurity Risks	Cybersecurity Policies and Training	HEIs	Secure Digital Ecosystems
Resistance to Change	Change Management Programmes	Leadership Teams	Improved Adoption
Sustainability Concerns	Adoption of IMADT Framework	Governments & Hels	Long-Term Educational Resilience

**Table 9:** Proposed IMADT Dimensions for Post-COVID Higher Education Transformation.

IMADT Dimension	Strategic Focus	Key Performance Indicators (KPIs)
Technology	Digital Infrastructure	LMS Utilisation Rate
Leadership	Agile Leadership	Leadership Agility Score
Strategy	Digital Transformation Planning	Transformation Maturity Index
Governance	Digital Governance	Policy Compliance Rate
People	Digital Skills Development	Digital Competency Score
Culture	Innovation Culture	Innovation Adoption Index
Innovation	New Learning Models	Number of Digital Innovations
Agility	Organisational Responsiveness	Transformation Speed Index

## 8. Conclusion

The COVID-19 pandemic profoundly transformed Higher Education Institutions across West Africa. Although initially perceived as a crisis, the pandemic ultimately accelerated digital transformation, stimulated innovation, enhanced digital literacy, strengthened virtual learning ecosystems, and promoted agile leadership practices.

The findings demonstrate that digital transformation is not merely a technological initiative but a multidimensional organisational transformation involving strategy, leadership, governance, people, culture, and innovation.

The pandemic has permanently altered educational delivery models and accelerated the transition towards blended and phygital learning ecosystems. Institutions that continue investing in digital capabilities, agile leadership, and innovation will be better positioned to achieve sustainable competitive advantage and contribute meaningfully to the attainment of Sustainable Development Goal 4.

The study concludes that COVID-19 transformed from a disruptive crisis into a catalyst for educational transformation, providing a unique opportunity for HEIs in West Africa to build resilient, inclusive, and future-ready learning ecosystems.

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