

Digital Transformation in the Post-COVID Era in Selected Zambian Public Universities: Opportunities and Challenges

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ABSTRACT: The COVID-19 pandemic accelerated digital transformation in Zambia's public universities, compelling institutions to rapidly adopt online and blended learning modalities to maintain teaching and academic continuity. Although initially introduced as emergency responses, these digital practices have increasingly become institutionalised in the post-pandemic context. Drawing on empirical evidence from surveys, interviews, and case studies conducted at three public universities; the University of Zambia, Mukuba University, and Kwame Nkrumah University, this study examines the nature of digital transformation and its implications for higher education in Zambia. The findings indicate that the adoption of digital technologies has enhanced flexibility in teaching and learning, expanded access for certain student groups, and supported pedagogical innovation. Nonetheless, the transition has also revealed enduring challenges, including inadequate digital infrastructure, unreliable internet connectivity, disparities in digital literacy among staff and students, concerns regarding academic integrity, and the potential to deepen existing inequalities. The study concludes that sustainable digital transformation requires coherent institutional policies, ethical governance frameworks, and sustained investment that foreground equity, inclusivity, and quality assurance.

KEYWORDS: Digital transformation, COVID-19 pandemic, Zambian public universities, Online and blended learning

1. INTRODUCTION

1.1 Background

In early 2020, the outbreak of Coronavirus disease (COVID-19) precipitated widespread disruptions across all sectors, compelling institutions globally to rapidly alter their modes of operation to mitigate the health and social impacts of the pandemic. The education sector was particularly affected, as schools, colleges, and universities were forced to suspend conventional face-to-face teaching and learning activities (Mukwena & Sinkala, 2020). This unprecedented disruption necessitated the swift adoption of alternative instructional approaches, notably remote and online learning, often implemented under emergency conditions and with limited institutional preparedness.

In Zambia, the government responded by ordering the closure of all educational institutions as a public health measure to contain the spread of the virus. Consequently, public universities were required to abruptly transition from traditional classroom-based instruction to remote and online teaching and learning modalities (Mwiinga et al., 2021). While this rapid shift revealed significant systemic constraints, such as infrastructural limitations, uneven digital readiness, and capacity gaps, it also brought to light previously underutilised opportunities for integrating digital technologies within the higher education sector.

The transition demonstrated the potential of digital learning to extend educational provision beyond the physical campus, enabling universities to reach students who were geographically dispersed, including those in rural and hard-to-reach areas. It also introduced greater flexibility into teaching and learning by supporting self-paced study, asynchronous engagement, and continued access to learning materials during disruptions. The adoption of digital platforms such as Moodle and Google Classroom facilitated asynchronous instruction, improved communication between lecturers and students, and ensured continuity of learning despite prolonged campus closures.

Beyond immediate instructional responses, the pandemic prompted public universities to critically re-examine their strategic priorities, particularly in relation to digital infrastructure, knowledge management systems, staff digital competencies, and the long-term sustainability of e-learning initiatives. In this way, the emergency shift to online learning acted as a catalyst for broader

Digital Transformation in the Post-COVID Era in Selected Zambian Public Universities: Opportunities and Challenges

institutional reflection on resilience, innovation, and the strategic integration of digital technologies in higher education (Chiwoya, Daka & Mulenga-Hagane, 2025).

At the same time, the rapid shift to remote and online learning exposed significant and deeply rooted challenges within the higher education system. Many students lacked reliable access to essential resources such as appropriate digital devices, affordable and stable internet connectivity, and consistent electricity supply in their homes. These constraints disproportionately affected students from low-income households and those living in rural or peri-urban areas, thereby amplifying existing inequalities in access to higher education. In addition to material limitations, both lecturers and students exhibited uneven levels of digital readiness, including limited skills and confidence in the use of online learning platforms, digital assessment tools, and virtual communication technologies. Institutional capacity to support this transition was also frequently inadequate, with universities facing constraints related to server capacity, internet bandwidth, learning management system performance, and the availability of timely technical support (Musonda, Sinkala, Mumba & Nondo, 2023).

Empirical evidence from specific institutional contexts further illustrates these challenges. A survey of students in Kitwe revealed that more than 56% lacked adequate access to ICT devices, electricity, or internet services at home during the period of remote learning, significantly constraining their participation in online education. Many respondents also reported that subjects such as mathematics were more effectively taught and understood through face-to-face interaction, highlighting the pedagogical limitations of fully online delivery in certain disciplines (Mukuka et al., 2021). Similarly, a study of final-year medical students at the University of Zambia found that prolonged power outages, lasting up to 15 hours per day in some communities, poor network connectivity, and the lack of physical access to campus-based learning facilities severely undermined the effectiveness of online learning. These conditions disrupted synchronous learning, limited access to digital resources, and negatively affected students' preparedness for clinical and professional practice (Limbumbu et al., 2022).

Thus, what began as a stop-gap emergency strategy has surfaced enduring opportunities but also deep structural and ethical issues that must be addressed to make digital transformation in Zambian public universities sustainable and inclusive. As the acute crisis subsides, there is a move to embed digital transformation into the normal operations of public universities: in teaching, learning, assessment, research, and administration. However, for this embedding to be beneficial and just, it is important to base strategies on empirical evidence about what has worked, what has not, and what ethical questions these transformations give rise to.

1.2 Statement of the problem

The abrupt closure of Zambian public universities during COVID-19 forced an emergency transition from face-to-face to online learning, exposing both opportunities and systemic weaknesses. While digital platforms enabled continuity, flexibility, and broader reach, many students lacked access to devices, reliable electricity, and internet connectivity, disproportionately affecting low-income and rural learners. Lecturers and students also faced limited digital skills, while institutional infrastructure and support were often inadequate. Certain disciplines, particularly practical or quantitative subjects, were poorly suited to fully online delivery. These challenges highlight the need for evidence-based, inclusive, and sustainable strategies to embed digital transformation effectively in Zambian higher education.

1.2 Research Questions

This paper addresses three main questions:

- What empirical evidence exists from Zambian public universities about the opportunities of digital transformation post-COVID?
- What ethical, infrastructural, and policy challenges emerge from this evidence?
- What recommendations can be drawn from these data to guide ethical, inclusive, and sustainable digital transformation?

2. METHODOLOGY

This study employs a qualitative synthesis approach, drawing on empirical evidence from recent research within Zambian higher education. It involves a systematic review of published case studies and reports examining digital transformation and online learning experiences in public universities. Secondary data sources include peer-reviewed journal articles, postgraduate theses, conference papers, and institutional or policy reports produced between 2021 and 2025, capturing both the emergency COVID-19 response and the post-pandemic transition.

Studies were selected through targeted searches of academic databases and institutional repositories, with inclusion criteria focusing on research that explicitly addresses Zambian public universities and presents empirical findings. From these sources, data were extracted on thematic areas such as stakeholder attitudes toward digital learning, experiences of students and staff, infrastructural and institutional barriers, enabling factors, and ethical or equity considerations. Where available, quantitative indicators, such as access to devices, connectivity, and participation, were included to complement qualitative insights.

Digital Transformation in the Post-COVID Era in Selected Zambian Public Universities: Opportunities and Challenges

Data were analysed thematically to identify patterns, convergences, and divergences across contexts, providing a comprehensive understanding of digital transformation in Zambian public universities.

3. LITERATURE REVIEW

Digital Transformation and E-Learning in Zambian Higher Education

The following section presents a synthesis of findings from published empirical studies that examine the implementation and outcomes of digital transformation in selected Zambian public universities. Drawing on both quantitative and qualitative evidence, the review provides a comprehensive account of how digital technologies have been introduced and utilised in teaching and learning processes across different institutional contexts. It examines the strategies adopted by lecturers to respond to digital and infrastructural challenges, as well as students' experiences, perceptions, and levels of engagement with online and blended learning. Collectively, the studies highlight the dynamic and interconnected relationship between institutional infrastructure, availability of technological resources, pedagogical innovation, and the attitudes and capacities of both lecturers and students in shaping the effectiveness, sustainability, and equity of digital initiatives in higher education.

3.1 Evidence from the University of Zambia (UNZA)

A qualitative case study conducted by Lufungulo, Mwila, and Mambwe (2022) investigated how lecturers at the University of Zambia navigated online teaching during the COVID-19 pandemic in a low-resource environment. The study involved interviews with 21 lecturers from the Faculties of Education, Humanities and Social Sciences, and Health Sciences. Findings indicate that lecturers employed a range of adaptive strategies to maintain instructional continuity. These strategies included leveraging Open Educational Resources (OERs), designing flexible lesson structures that minimized reliance on high-bandwidth platforms, and using mobile phones and messaging applications such as WhatsApp for asynchronous content delivery. Lecturers also adapted teaching materials to match the available devices and connectivity constraints of students.

The study highlighted several key enablers that facilitated lecturers' adaptations, such as intrinsic motivation to innovate, access to basic ICT devices, familiarity with OERs, and some level of internet connectivity. Nonetheless, significant barriers persisted, including inconsistent electricity supply, limited bandwidth, inadequate institutional support, and insufficient access to specialized software or learning tools. These findings demonstrate that while lecturers' ingenuity and commitment helped mitigate the impact of infrastructural limitations, structural and systemic challenges remained a critical constraint on digital transformation at UNZA.

Students' Perspectives on Blended Learning

A cross-sectional survey conducted by Mudenda et al. (2023) involving 737 health students at UNZA examined student experiences and preferences regarding blended learning. Data collected between October 2022 and April 2023 revealed nuanced student attitudes: 56.5% of respondents supported the continuation of blended learning post-pandemic, yet only 22% preferred fully online instruction. The majority of students (78.4%) perceived group discussions as more effective in face-to-face settings than online. Furthermore, 67.1% disagreed that online learning could replace traditional classroom-based instruction, and 77.6% reported higher satisfaction with in-person classes. These results suggest that while students acknowledge the potential of digital platforms, face-to-face engagement remains central to effective learning experiences in the Zambian context.

Attitudes among Pharmacy Students

A targeted survey by Kampamba, Chiluba, Hikaambo, Lufungulo, and Mwila (2023) explored the attitudes of 240 pharmacy students at UNZA toward online learning. Findings indicate that 62% held negative perceptions of digital learning modalities, with 58.3% believing that online methods were less effective than traditional instruction. Despite this, 58.6% expressed a willingness to adapt to and improve online learning approaches to better align with their needs. This highlights a complex interplay between scepticism regarding digital learning efficacy and a readiness to engage with technological solutions when adequately supported.

3.2 Evidence from Mukuba University

Banda, Tailoka, and Muma (2021) conducted a quasi-experimental study to examine the effect of e-learning on academic performance among third-year statistics students at Mukuba University. The study compared two groups: an experimental group that engaged with course material through an e-learning platform and a control group that received traditional face-to-face lectures. The researchers aimed to assess not only overall performance but also students' conceptual understanding of complex quantitative topics, including Gamma and Beta functions, as well as probability distributions.

The results indicated that students in the e-learning group consistently outperformed their counterparts in the control group in assessments measuring both knowledge retention and conceptual understanding. In particular, the e-learning cohort demonstrated a deeper grasp of abstract statistical concepts, likely due to the flexibility and interactivity offered by the digital platform. Students could review lecture materials at their own pace, engage with multimedia resources, and access practice exercises and instant feedback, which reinforced learning and helped bridge gaps in understanding.

Lecturers' Attitudes and Barriers to ICT Integration

A survey of 163 lecturers across Zambian higher education institutions by Kunda, Chembe, and Mukupa (2018) identified several persistent barriers to integrating ICTs into teaching and research. Key obstacles included insufficient internet bandwidth, inadequate hardware and software resources (e.g., outdated computers and limited access to specialized tools), weak or absent technical and administrative support, and limited opportunities for professional development in digital competencies. Additional challenges involved unreliable power supply, financial constraints, and, in some cases, negative attitudes or low motivation among lecturers toward ICT adoption. Collectively, these findings point to structural, resource, and human capacity limitations that continue to hinder widespread ICT integration in Zambian universities.

Student Engagement in Blended and Online Learning

Kangwa, Msafiri, Wan, and Fute (2024) conducted a survey of 1,323 undergraduates across four Zambian universities offering blended learning. Their study emphasized the critical role of student self-regulation in mediating the relationship between teacher-scaffolded online interactions and learning engagement. Specifically, students who received structured support, including interactive online tasks, timely feedback, and facilitated discussions, demonstrated significantly higher engagement if they were also able to manage their own learning through time management, motivation, and self-directed strategies. The study concluded that teacher support alone is insufficient; empowering students with self-regulation skills is essential to maximize engagement and learning outcomes in digital and blended learning environments.

3.3 Evidence from Kwame Nkrumah University (KNU)

Magasu, Mileji, and Lubungu (2021) conducted a qualitative study to investigate the inclusiveness of e-learning for undergraduate students enrolled in both full-time and distance learning programs at KNU during the COVID-19 pandemic. The study surveyed 35 students through both physical and online instruments, including WhatsApp groups and zoom, between May and July 2020. Findings revealed that only about 20% of students actively engaged in e-learning during the quarantine period. Most students accessed e-learning via Android mobile phones, reflecting limited availability of more robust computing devices.

The study identified several barriers to accessibility. These included students' inability to pay the 50% fee threshold required to access online lectures, lack of smartphones, inadequate orientation on e-learning tools, poor internet connectivity, and unfavorable home study environments. Notably, students from remote areas and those with impairments were disproportionately affected. These findings underscore the inequities inherent in digital learning environments and the need for inclusive policies that ensure equitable access. The study recommended that KNU management devise a flexible and inclusive education system that integrates employability skills while mitigating accessibility challenges.

Implementation of Blended Learning

In a subsequent study, Magasu et al. (2022) explored the implementation of blended learning at KNU. The study involved 36 participants and employed inductive thematic analysis to extract insights from the data. Participants conceptualized blended learning as a combination of face-to-face interaction and online teaching. However, both students and lecturers in some faculties were hesitant or unwilling to adopt blended learning.

Several challenges emerged from this study. Large class sizes, often exceeding 200 students, made it difficult to adhere to COVID-19 safety protocols, limiting the feasibility of face-to-face interactions. Access to online services was again restricted by the 50% tuition fee threshold. Additional barriers included poor internet connectivity, limitations of the e-learning platform MOODLE, insufficient institutional infrastructure, and challenges faced by visually impaired students in accessing digital resources. The study recommended substantial investment in ICT infrastructure and the provision of student orientation programs to enhance the effectiveness of blended learning. The authors also emphasized the need for future research to examine the readiness of the university's ICT department to support such initiatives.

Effectiveness of E-Learning in the Post-COVID-19 Era

Siame and Hachintu (2023) conducted a qualitative study assessing the effectiveness of e-learning at KNU during the post-COVID-19 period. While e-learning had been widely adopted, the study identified persistent challenges that hinder its effective implementation. These included inadequate infrastructure, limited internet access, insufficient e-learning facilities, high costs associated with internet use, and inadequate technical skills among both educators and students. Additionally, negative attitudes toward e-learning and inconsistency in program delivery were highlighted as significant obstacles.

The study recommended targeted investments in ICT infrastructure and comprehensive training programs for educators and students to improve digital competencies. By addressing these structural and human capacity constraints, KNU could enhance the adoption and sustainability of e-learning in the post-pandemic period. The findings also have broader implications for policymakers and higher education administrators seeking to improve the quality and accessibility of education delivery in Zambia.

4. SYNTHESIS OF FINDINGS: OPPORTUNITIES AND CHALLENGES OF DIGITAL AND BLENDED LEARNING IN SELECTED ZAMBIAN PUBLIC UNIVERSITIES

4.1 Lecturer Strategies and Enablers

Empirical evidence indicates that lecturers across the selected universities, including UNZA and KNU, employed adaptive strategies to sustain teaching during disruptions such as COVID-19. These strategies included the use of Open Educational Resources (OERs), flexible lesson design, mobile phones, and messaging applications for content delivery. Key enablers of successful digital adoption were lecturers' intrinsic motivation, familiarity with digital tools, and willingness to innovate pedagogically. However, constraints such as large class sizes, inadequate infrastructure, and limited institutional support significantly restricted the scope and effectiveness of these strategies.

4.2 Student Experiences and Engagement

Students' attitudes toward online and blended learning were mixed. While many preferred face-to-face interactions for discussions and overall satisfaction, some demonstrated adaptability to online modes. Engagement was highest among students possessing strong self-regulation, time-management, and motivation skills, highlighting the importance of learner autonomy in digital environments. Recorded lectures and flexible access to learning materials also provided opportunities for self-paced learning and continuity amid disruptions.

4.3 Impact on Learning Outcomes

Digital learning demonstrated potential to improve academic performance, particularly in quantitative and concept-heavy subjects such as statistics. When platforms allowed interactive and flexible learning, students were able to achieve higher levels of conceptual understanding and knowledge retention. This suggests that digital and blended modalities can complement traditional instruction to enhance pedagogical effectiveness.

5. CONCLUSION

Empirical evidence from selected Zambian public universities indicates that digital transformation presents notable opportunities, including increased flexibility, expanded access through blended learning, pedagogical innovation, and improved learning outcomes in certain disciplines. However, these gains are limited by persistent ethical and practical challenges, such as unequal access to digital devices and internet connectivity, inadequate infrastructure, negative stakeholder attitudes, and difficulties related to assessment and home-based learning environments.

To ensure that digital transformation is effective, ethical, and sustainable, implementation strategies must be grounded in evidence, inclusivity, and adequate institutional support. This entails sustained investment in infrastructure, targeted student support, faculty capacity building, clear policies on academic integrity and data protection, and measures that promote equitable access for all learners.

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