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Towards Digital Transformation of Selected Ghanaian Public Universities: Leadership Enablers, Challenges, and Opportunities

RESEARCH ARTICLE

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ABSTRACT

Digital transformation (DT) has become essential for higher education institutions (HEIs), with its value becoming increasingly evident since the COVID-19 pandemic. This holds true for HEIs in developing countries as well, where DT is a strategic priority despite the challenges posed by the digital divide. Leadership is recognized as both a critical factor and a prerequisite for successful implementation of DT in HEI within such contexts. This study explored challenges and leadership responses that facilitate successful DT implementation in the context of Ghanaian HEIs. The study aims to offer insights for policymakers, administrators, and stakeholders within African HEIs, to facilitate the development of contextually relevant and effective DT strategies. Employing a qualitative multiple case study approach, data was collected through semi-structured interviews with senior administrators leading Open, Distance, and Digital Education (ODDE) implementation at three Ghanaian public universities. Thematic and content analysis were then used to analyze the interview data. The findings revealed that the universities were driven to pursue DT initiatives by both internal demands (e.g., to improve existing service delivery through technology) and external pressures to use the affordances of technology to increase access and participation through non-traditional learning modes. Despite facing structural, technological, and human resource challenges, the study observed positive signs of leadership-enabled DT initiatives to support post-COVID-19 efforts. However, these efforts have unfolded within a less coordinated policy climate and have been predominantly driven top-down, with Vice-Chancellors initiating and spearheading digital leadership responses. Meanwhile, there was little evidence of cross-cutting leadership across the universities to support DT efforts. The study concludes by arguing for the contextualisation of DT in higher education and offers suggestions for university leaders in Ghana and other relevant developing contexts to enhance their DT efforts.

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INTRODUCTION

The profound impact of COVID-19 on the higher education (HE) landscape has increased attention on DT, which is seen as a strategic imperative for HEIs to maintain their relevance in a post-COVID-19 era (Al-Ali & Marks, 2022; Engel et al., 2023; Glennie & Paul, 2023). DT implies a process of "organisational change that is triggered and shaped by the widespread diffusion of digital technologies" (Hanelt et al., 2021, p. 1160). In the context of HE, these technology-enabled changes (Vial, 2019) cut across cultural and workforce dimensions; redefining how HEIs fulfil their core mandate of teaching, research, and community service (Brown et al., 2020; García-Peñalvo, 2021).

HEIs have traditionally been seen as complex organisations, in part due to their multi-stakeholder governance systems and lethargic approach to change (Paul, 2023; Schophuizen et al., 2022). Yet, the pandemic has emerged as a disruptor and necessitated changes across all levels of the university (Anwar & Adnan, 2020; Bozkurt & Sharma, 2022; Jakoet-Salie & Ramaboe, 2023). Digital tools became more essential during the pandemic, thus increasing HEIs' motivation to embark on DT. However, it is widely recognized that the opportunities offered by the digital transformation are not equally accessible to all (Bartikowski et al., 2018). This is particularly true for HEIs located in resource-constrained countries such as Ghana, where the impact of the digital divide was clearly evident during COVID-19 (Amponsah & Bekele, 2023; Essel et al., 2021; Kumi-Yeboah et al., 2023). In such contexts, HEIs require increased institutional support, which is vital for DT (Bond et al., 2018).

The imperative for DT is undeniable for HEIs globally. However, successful implementation presents distinct challenges, particularly in African HEIs with resource constraints. Effective DT hinges on a well-defined strategic vision, coupled with judicious resource allocation and pragmatic implementation strategies (Broadbent et al., 2023). African HEIs often face limitations in these areas, highlighting the critical role of leadership as a critical determinant in orchestrating and guiding different elements of the DT process. A previous study by Cohen et al. (2019) reinforces this notion, demonstrating that successful large-scale change programmes are significantly more likely when leaders model the desired behaviours. Effective leadership is thus a key determinant of successful DT in HEIs.

The need for DT is particularly acute in resource-scarce contexts, such as those faced by many African HEIs. In these situations, it is crucial for these institutions to ensure that their DT aspirations align with available resources and realistic possibilities. A one-size-fits-all approach is inadequate; instead, context-specific solutions that leverage existing strengths are essential. Effective DT requires sustained leadership focus, not merely reactive responses only during crisis (Hinings et al., 2018). The complexity of contemporary DT necessitates a multifaceted approach that involves the coordination of people, processes, and tools (Hesse et al., 2021). The leaders driving successful DT must possess a nuanced understanding of institutional policies and the know-how to navigate and influence their complexities (Brown, 2023; Graham et al., 2023).

As has been established, deliberate strategies at the organisational level designed to achieve sustainable outcomes play a central role in successful teaching and learning practices. For instance, Broadbent et al. (2023) demonstrate how meso-level issues such as policies and strategic directives can have a significant impact on the sustainability of Open, Distance, and Digital Education (ODDE) practices in the aftermath of COVID-19. Futhermore, Kumi-Yeboah et al. (2023) argue that mitigation strategies to close the digital divide can enhance teaching and learning using digital technologies. Addressing the digital divide requires African HEIs to re-examine the underlying assumptions driving current HE, as Means and Neisler (2021) argue.

The COVID-19 pandemic may have inadvertently revealed an intrinsic drive for innovation that was previously lacking (Belluigi et al., 2020). However, the long-term impact of these pandemic-driven changes on sustainable ODDE implementation in African HEIs is unclear. Amponsah and Bekele (2023) claim that Africa is "poised to embrace digital technologies more significantly in the post-pandemic era" (p. 1437). Examining the leadership strategies developed to sustain the momentum of DT can offer valuable insights and serve as a barometer for DT implementation, revealing the strategic actions taken to deepen and sustain ODDE practices.

The convergence of DT and effective leadership is crucial for driving strategic changes necessary for HEIs to remain competitive (Brown, 2023; Carvalho, 2022). However, there is a dearth in their application in "digitally challenged contexts" (Loglo, 2023). To address this gap, this study assesses critical leadership-driven, strategic factors in three Ghanaian public universities, with the aim of uncovering leadership actions and decisions that significantly facilitate and sustain DT efforts, particularly in the post-COVID-19 era. By highlighting these leadership actions, the study aims to provide insights and implications for policymakers, administrators, and stakeholders within African HEIs; and to facilitate the development of contextually appropriate and effective DT strategies and policies that address the specific needs and challenges prevalent in the African context.

LITERATURE REVIEW

DIGITAL TRANSFORMATION IN HIGHER EDUCATION

The significance of DT in HE was particularly accentuated during and after the COVID-19 pandemic (Bozkurt & Sharma, 2022; Marks & Al-Ahli, 2022; Rodrıguez-Abitia & Bribiesca-Correa, 2021). While HEIs have come under scrutiny regarding their slow progress in DT (e.g., Brown et al., 2020), UNESCO (2023) identifies higher education as the fastest adopter and most transformed by digital technologies within the educational space. This observation, however, requires a nuanced examination as in general, the areas of focus for DT vary across different contexts (Lustosa Rosario et al., 2021) and suffer from a lack of certainty regarding what DT encompasses (Benavides et al., 2020; Hanelt et al., 2021).

Some authors approach DT with a focus on the application and benefits of technology in the teaching and learning processes (e.g., Bond et al., 2018), while others highlight institutional digital maturity and readiness as focal areas (e.g., Gurumurthy & Schatsky, 2019; Kane, 2017). Another approach assesses digital innovations at sub-organisational levels, such as departments and faculties/schools (e.g., Vial, 2019), while others emphasize university-wide digitalisation efforts (e.g., Fernández et al., 2023). A contemporary approach combines strategy, technology, and workplace culture in delivering value related to the core functions of HEIs (Brooks & McCormack, 2020; Reinitz, 2020).

These multiple perspectives applied to DT make it difficult to reach a consensus on, and to consolidate the elements within DT in HE (Benavides et al., 2020). The varying dimensions for assessing DT efforts highlight the importance of contextualization over attempts to establish universal criteria (Bond et al., 2018; Rodríguez-Abitia & Bribiesca-Correa, 2021; Taher, 2023; Xiao, 2023). The complexity is further compounded by the absence of a nuanced distinction in the use of the terms, *digitisation*, *digitalisation*, and *DT,* which are often used interchangeably (Reinitz, 2020; Schallmo et al., 2017; Wessel et al., 2021). These three terms can be viewed as a continuum, ranging from a simplified conversion of analogue artifacts to digital artifacts on one end, to the embeddedness of technology in transforming the value proposition of the organisation on the other end. Fernández et al. (2023) made one of the clearest distinctions between digitalisation, defined as the optimization of existing processes through technology, and DT, which involves using technology to create new processes that offer high strategic value to the university.

What is clear, however, is that DT in education simply goes beyond merely adopting or upgrading technology for teaching and learning, or switching in-person to online classes (Bozkurt & Sharma, 2022; Graham et al., 2023). DT requires strategies and leadership that enable adaptation to changing environmental dynamics (Schallmo et al., 2019; Arnold & Sangrà; 2018). This involves the strategic integration of digital technologies into educational processes and institutional practices to create additional and differentiated value for its stakeholders (Brown et al., 2020; Laufer et al., 2021). These strategies may include online or blended offerings (flexible modes), internationalisation, enhanced student support, and enhanced quality. Overcoming the challenge of multiple interpretations and ensuring successful contextualization of DT efforts requires visionary leadership, coupled with a culture of collaboration, and a deep understanding of local policies and systems (Carvalho et al., 2022; Mergel et al., 2019). That notwithstanding, university policymakers have thus been urged to "have a more balanced vision of DT rather than merely concentrate on the "material" benefits of DT" (Xiao, 2023, p. 197).

AFRICAN HIGHER EDUCATION AND THE DIGITAL DIVIDE

The concept of digital divide has evolved over the years. Its initial definition was the gap between individuals with access to computers and the internet and those without (Lythreatis et al., 2022; van Dijk, 2020). This gained a lot of research attention and was termed as the *first-level digital divide*. The scholarship on the concept later evolved from the division based on mere access to computers and the internet to how they are used. This interest in the differentiated use and gaps in the digital skills of individuals was later termed as the *second-level digital divide*, which encompasses concepts such as digital inequalities (e.g., Hargittai, 2002) and self-efficacy (e.g. Eastin & La Rose, 2000), that focused on both technical and psychological dimensions. Using access and skills as input, a *third-level digital divide* emerged from the critique that access to, and use of computers and the internet do not necessarily lead to beneficial outcomes for all (Ragnedda, 2017; Van Deursen et al., 2015). Hence, there is a need to pay attention to inequality of outcomes (Selwyn, 2004; van Dijk, 2020).

In contemporary studies, researchers use the term digital divide to acknowledge that socioeconomic factors such as income, geography, and education often lead to unequal outcomes of information and communication technology (I.C.T) among specific groups (e.g., Jaggars et al., 2021; Laufer et al., 2021). In the context of HE, digital divide is used to refer to inequalities regarding the access and use of digital technologies among students, educators, and institutions, which impedes their effective participation in society (Correa et al., 2024; van de Werfhorst et al., 2022; van Dijk, 2020). For example, the International Telecommunication Union, which publishes annual facts and figures on the global access and use of the internet, show that developing countries continue to perform the lowest in all areas.

The sudden transition to digital learning occasioned by the COVID-19 pandemic highlighted the extent of the digital divide in many developing countries (Ajonbadi, 2023; Amponsah, 2021; Bozkurt et al., 2020; Czerniewicz et al., 2020), with some HEIs totally cancelling teaching due to a lack of viable alternatives. According to Bekele (2021), the response efficacy of African HEIs during the COVID-19 pandemic was contingent upon their economic capital, institutional culture, and resilience. Consequently, Bekele (2021) proposed three classifications based on the capabilities of African HEIs to sustain teaching and learning during the pandemic:

1) *The Transformationalists* – HEIs that integrated some form of learning technologies pre-pandemic, which led to a smoother transition;
2) *The Late Experimenters* – HEIs that initiated the implementation of digital teaching *de novo* following the pandemic-induced university closures;
3) *The Laggards* – HEIs that could not integrate any form of technology during the pandemic owing to severe technological deficiencies.

From these classifications, leadership emerges as a prominent underlying factor in the level of institutional responses.

African HEIs have been central to discussions on the digital divide because of challenges in accessing digital technologies, mostly driven by economic factors (Essel et al., 2021; Hülsmann & Shabalala, 2016) and reported deficiencies in digital skills (Belluigi et al., 2020; Czerniewicz et al., 2020; Taher, 2023). For example, Africa has the most expensive internet in the world (Munyati, 2020). While the proliferation of mobile phones and its use for learning may suggest progress in bridging this gap, Correa et al. (2024) debunks this notion by arguing that reliance on mobile internet may result in lower digital skills acquisition and limited online engagement compared to computer use. This argument is corroborated by Fernández et al. (2023), who highlighted the limiting abilities of mobile phones for complex online learning activities compared to computers. Consequently, despite the prevalence of mobile learning in African HE, challenges such as inadequate computer access and quality internet infrastructure may result in unrealised digital education outcomes. This is partly exemplified by the prevalence of transmissive mode of learning (Loglo & Zawacki-Richter, 2023), and hedonistic use of digital media (Loglo et al., 2024) within the context, acheived through mobile phones.

The poor infrastructure contributes to a context challenged by both first-level, and second-level digital divides and makes it more challenging to derive beneficial outcomes from the widespread

adoption of digital technologies. Therefore, addressing the various systemic barriers becomes paramount and requires digital leadership (Hesse et al., 2021). To facilitate DT, the combined effects of addressing access issues and promoting effective use of digital technologies must widen access and participation, innovate teaching practices, and enhance support services for faculty and students to create differentiated value for stakeholders (Brown et al., 2020).

THE PRESENT STUDY

In synthesizing Digital Transformation Frameworks across organisations and educational systems, McCarthy et al. (2023) identified four critical areas for consideration during DT implementation: *Leadership, People, Technology,* and *Experience*. However, leadership was singled out as the greatest need for effective DT. This affirms the position taken by several scholars, who stress the strategic importance of leadership in achieving DT in education (e.g., Bygstad et al., 2022; Brown et al., 2020; Graham et al., 2023; Kane, 2017; Klein, 2020). Other studies in developing contexts also underscore the role of HEI leaders in guiding their institutions towards the path of digital transformation amidst numerous digital challenges (Buabeng-Andoh, 2012; Landa et al., 2023); paramount among which is addressing the various systemic barriers created by the digital divide as earlier outlined.

As DT is anchored on the dynamic interplay between strategy and technology for organisational change management (Hanelt et al., 2021), the present study situates DT within the meso-level of research and assesses leadership actions through the lenses of McCarthy et al.'s (2023) *Leadership* component that include six dimensions: *(1) Vision and purpose, (2) Culture with Trust and Coherence*, *(3) Strategic Planning, Business Planning & Sustainability, (4) Policy, Risk, Compliance, & Governance*, *(5) Measurement, and (6) Partnerships & Community Engagement*.

Additionally, this study situates digital teaching and learning approaches geared towards DT within the context of Open, Distance, and Digital Education (ODDE). ODDE as a terminology embraces the historical origins of recent online education, and contemporary approaches to teaching and learning with digital media in the context of the DT of educational institutions (Zawacki-Richter & Jung, 2023). In conceptualizing the term ODDE, the authors remarked that:

> *We conceptualize ODDE as an overarching term to refer to all kinds of learning and teaching processes in which [...] educational technology, digital media, and tools are used to present and deliver content, as well as facilitate and support communication, interaction, collaboration, assessment, and evaluation. Thus, ODDE is not monolithic in form. It includes various types, from technology-enhanced education, to flipped learning and blended learning, and to fully online education (p. 6)*

Thus, the present study aims to explore how leadership actions and responses in the selected Ghanaian public universities facilitate and sustain the implementation of ODDE towards DT. To achieve this goal, the study specifically addresses the following research questions:

1. What specific strategic goals guide the selected universities towards DT?
2. What are the critical challenges that threaten the successful implementation of ODDE and, ultimately, DT in the selected universities?
3. Which specific strategic leadership actions have the selected universities undertaken regarding ODDE, and how do these actions contribute to facilitating DT?

METHODS

RESEARCH DESIGN

This study employed a qualitative multiple case study informed by Yin (2018) to investigate management and organisational (meso-level) issues that facilitate DT in Ghanaian public universities. The specific focus on meso-level aligns with Zawacki-Richter and Bozkurt's (2023) 3M-Framework of ODDE research and provides a sound basis for understanding the complexities of management and organisational-level elements. This framework informed the participant selection based on their strategic roles connected with ODDE implementation within their respective institutions. A qualitative approach allows for in-depth exploration of

their perceptions, challenges, and leadership responses, providing a richer understanding of the phenomenon (Creswell, 2013).

Furthermore, McCarthy et al.'s (2023) leadership dimension of digital transformation framework guided the development of interview questions to explore leadership aspects of DT within these institutions. This approach aligns with both an interpretive paradigm of research (Creswell, 2013) due to its focus on understanding participants' experiences, and a constructivist epistemology (Burns et al., 2022) as it acknowledges the socially constructed nature of knowledge around DT within these institutions.

CASE AND SAMPLE SELECTION

Of the 16 public universities in Ghana,[1] three were purposively selected for the study based on a set of criteria:

- Institutional history: two traditional universities, and one more-recently established university were chosen to capture a range of historical contexts
- Instructional modality: all three universities are dual-mode, offering both campus-based and distance learning options.
- Size and capacity: the universities vary in size in terms of enrolment and programme portfolio to reflect the diversity of Ghanaian public HEIs
- Geographical spread: the chosen universities are located in different regions in Ghana; and
- ODDE implementation: the scale of ODDE interventions within each institution was considered.

In line with the meso-level focus of the study, participants consisted of 22 senior administrators from the three public universities selected for this research. These administrators (including academics with administrative roles) were purposively selected based on their roles within the ODDE value chain. Their positions granted them significant influence on the DT efforts within their respective institutions (see Table 1). To ensure anonymity, they are referred to as University X, University Y, and University Z.

Table 1 Research participants.

NO.	DESIGNATION	NUMBER OF INTERVIEWS		
		UNIVERSITY X	UNIVERSITY Y	UNIVERSITY Z
1	Provost/Dean	3	1	1
2	Director/Dean, Distance Education	3	3	1
3	Director/Dean, Quality Assurance	1	1	1
4	Director, University I.C.T Directorate	1	1	1
5	Director, Specialized TEL Centre	1	1	1
6	Officer-In-Charge, Academic Affairs	–	1	-
	Sub-Total (per institution)	9	8	5
	Grand Total	22		

DATA COLLECTION METHOD

An interview guide was developed by the researcher and reviewed by an experienced researcher who developed of the 3M-Framework, to ensure relevance and clarity. Semi-structured interviews were conducted with participants between August 24, 2023, and September 16, 2023. The individual in-depth interviews lasted between 45 to 60 minutes each, and comprised open-ended questions that were used as prompts. All participants received copies of the interview guide ahead of time to allow them to prepare, and informed consent was obtained from each interviewee before the commencement of the interview.The questions related to participants' experiences, involvement, and perceptions regarding: (1) their institutions' goals

1 https://gtec.edu.gh/institution-category?name=Public%20University.

for pursuing DT, (2) the associated ODDE challenges that inhibit DT in their institutions, and (3) ODDE-related leadership actions that facilitate DT. All 22 interviews were electronically recorded and transcribed for data analysis.

DATA ANALYSIS

For Research Questions 1 and 2, thematic analysis was conducted along the lines of Braun and Clarke (2006). Patterns and themes from the data were used as categories for the data analysis, reflecting a cross-case analytical approach (Yin, 2018) to draw more generalizable insights, rather than a case-by-case analytical approach. In contrast, elements of content analysis were applied to Research Question 3, as the study framed leadership responses around McCarthy et al.'s (2023) six dimensions of Leadership. To analyze the data, the researcher first generated initial codes which were discussed and validated by a lead researcher in the lab. Following this validation process, the researcher interpreted the codes to identify broader categories within the data. Finally, by analyzing the relationships between the categories, theses were generated. Given the small sample size, thematic and content analysis were conducted manually, consistent with the suggestion by Creswell and Clark (2017).

LIMITATIONS

This qualitative study is not immune to the influence of researcher confirmation bias. This may be due to the researcher's familiarity with the context, and likely focus on interview data that may confirm existing beliefs about leadership responses and their impact on DT. To mitigate potential biases, the development of the interview guide and the coding, and analysis process involved senior and experienced researchers. Additionally, a case study of three institutions may not be representative of all HEIs in Ghana and cannot fully capture the diversity of developing country contexts. Despite these limitations, the study presents an important perspective on the critical role of leadership in facilitating sustainable DT in a resource-scarce public HE context.

FINDINGS AND DISCUSSION

RQ1. WHAT ARE THE UNIVERSITIES' GOALS FOR PURSUING DT?

Digital Transformation Goals

A critical aspect of this study was to ascertain the perspectives of senior administrators on their institutions' goals for pursuing DT. The responses revealed three principal dimensions within which their perspectives are framed: (1) enhancing teaching and learning using technology, (2) a shift in the service delivery process, and (3) a deliberate strategic organisational approach.

In the first dimension, respondents shared perspectives that framed DT as integrating technology into the fundamental functions of teaching, learning, and research, which constitute the primary mandate of universities. This integration is aimed towards achieving outcomes such as the adoption of innovative teaching methods and increasing the access and use of digital learning materials and online library resources. For example, a senior administrator from University Y remarked:

> *Our goal for using technology is to change the process of developing instructional materials, and then the mode of delivery and then the way assessments are conducted.*

Another respondent also highlighted how the newly installed smart classrooms in their university made it possible for students to attend in-person classes or join online. The majority of responses tended to gravitate towards the contested and erroneous notion that simply shifting classes online constituted DT (Bozkurt & Sharma, 2022; Hesse et al., 2021).

The second dimension emphasized DT as necessary to change the service delivery processes within the university. Here, the focus was on automation, particularly within the administrative set-up and academic support services. Within this context, there was an inherent acknowledgment of how the university is changing from doing things from the 'old way' to 'new ways'. Participants highlighted specific outcomes within this dimension that included speed, efficiency, and the enhancement of service delivery quality. Emphasis was made on

aspects such as managing students' academic records more efficiently through technology. An administrator also hinted at some COVID-19 induced changes when mentioning that doctoral defense sessions were now conducted online using videoconferencing technology, which was unthinkable of in the recent past.The views expressed by a senior administrator in University X sums up the second dimension:

> *The whole idea [for pursuing DT] is to move operations from paper to paperless and leveraging on technology…being able to move everything from manual processing to electronic processing right from when the student is admitted until graduation and afterwards.*

These views align more with the concept of digitalisation, which focuses on using technology to improve existing business processes (Fernández et al., 2023; Kane, 2017; Reinitz, 2020), and does not necessarily reflect a fundamental change in the value proposition of the institutions as DT requires (Brown, 2020; Hanelt et al., 2021; Vial, 2019).

The third dimension highlighted in the responses was that DT is being pursued as a deliberate organisational strategy by the universities in response to changing dynamics of the external environment. Participants highlighted the importance of deliberate organisational strategies to ensure that technology is integrated successfully. From the responses, there was a sense of the universities ensuring relevance in light of the digital age, signalling the need to adapt to the evolving technological landscape (Brown et al., 2020; García-Peñalvo, 2021). Multiple comments implied the necessity for value creation as part of the strategic direction the universities were pursuing. This included dimensions such as widening access through newly developed distance and flexible learning options which represents a key part of the digital transformation strategies of universities (Bond et al., 2018; Hesse et al., 2021). In articulating this view, a senior administrator in University Z said:

> *The whole idea is to have a holistic plan to ensure that we make maximum use of IT [information technology]. We have introduced new programmes that we deliver through blended mode, and we are almost ready to roll out our fully online programmes.*

The understanding of institutional DT goals varied among respondents, even from within the same institution. This disparity in awareness of the pursued DT objectives may be influenced by the proximity of their roles to technology operations (Brooks & McCormak, 2020) or a lack of clarity in the leadership's articulation of the institution's goals for pursuing DT (Hesse et al., 2021).

RQ2. WHAT ARE THE CRITICAL CHALLENGES THAT THREATEN THE SUCCESSFUL IMPLEMENTATION OF ODDE, AND THE PURSUIT OF DT IN THE SELECTED UNIVERSITIES?

The study explored the various challenges encountered by the universities in effectively implementing ODDE initiatives and advancing DT. Overall, the responses revealed five broad areas which generally align with Gkrimpizi et al.'s (2023) classification of barriers to DT in HEIs. The subsequent section discusses these critical strategic challenges.

Digital Access and Use Divide

Despite numerous interventions by universities to address the digital divide, challenges persist in the access and effective use of digital technologies among both students and faculty members. In recent years, mobile phones have emerged as the most commonly used devices by students (Adzifome & Adjei, 2023; Daniel & Bisaso, 2023). However, due to the inherent limitations of mobile phones for learning (Correa et al., 2024; Fernández et al., 2023), students exhibit a preference for using laptops in their learning activities (Kaliisa et al., 2019).

The high costs associated with acquiring laptops place responsibilities on students and lecturers to provide their own devices. A senior administrator from University Z emphasized:

> *The university does not supply lecturers with laptops. As I sit here, nobody has given me a laptop since I joined this university 11 years ago.*

Additionally, there is limited access to fixed broadband internet among Ghanaian higher education students (Loglo et al., 2024). Consequently, students and faculty members with no access to personal laptops and reliable internet at home often resorted to using the university's computer laboratories. Unfortunately, compared with laptops, on-campus computer laboratories do not afford students and faculty members the same flexibility and independence in time and space which is an important affordance of ODDE. The access challenges highlighted in this study align with the assertion that prevailing economic conditions in the Global South significantly impede the expansion of access to digital tools (Hill & Lawton, 2018; Hülsmann & Shabalala, 2016).

Beyond issues of access, and consistent with previous studies in the Ghanaian higher education context (e.g., Asamoah & Oheneba-Sakyi, 2023; Odame & Yalley, 2023), this study identified low digital competencies of both teachers and students as a challenge to the widespread adoption of digital education. Digital literacy, in general, has been found to be low among students and teachers in developing country contexts (Belluigi et al., 2020; Czerniewicz et al., 2020). Respondents could not confirm if their universities had formally developed or adopted a digital competency framework that outlines the essential digital skills their students are expected to acquire. Similarly, faculty professional development training programs did not adopt a competency-based approach. The use of competency frameworks for students and faculty members are believed to be crucial in addressing the digital literacy gap in Sub-Saharan Africa (Williamson et al., 2023).

Quality and Inadequacy of Technology Infrastructure

Technology infrastructure challenges have been identified as a long-standing obstacle to the development of ODDE in Sub-Saharan Africa (Mays, 2023; UNESCO, 2023). In particular, the availability, capacity, and quality of internet service provided within the universities is inadequate. Additionally, despite the installation of some computer labs for practical studies, many respondents expressed dissatisfaction with the quality of these computers. These challenges serve as a barrier to the widespread adoption of ODDE approaches among willing faculty members. Simultaneously, it reinforces the resistance observed among other faculty members who are hesitant to embrace these advancements. A senior administrator at University Z expressed the frustrations of faculty and students by indicating:

> *There can be days where the quality of the internet is very poor and makes it difficult to even stream a video. When this persists, it causes frustrations among faculty and students. This then gives the opportunity to critics to completely abandon the use of technology for teaching.*

This challenge, just as others, is clearly a function of funding. The institutions are reported to be grappling with challenges of inadequate funding for the needed technology investments. Funds were mainly originated from internally generated sources and were occasionally supplemented by fundraising activities. A senior administrator in University Y provided an illustration as follows:

> *Students are charged ICT levy and this amounts to a little over $1,000,000. This takes care of the cost of internet, software applications and subscriptions [...]and it is woefully inadequate. So sometimes you are asked to cut your budget, and this affects certain strategic interventions.*

Human resource challenges

Respondents drew attention to various human-resource challenges such as faculty workload, faculty motivation, faculty attitudes, and inadequate technical support manpower. In addition, respondents noted that efforts to enhance the digital skills of lecturers through professional development interventions were inadequate. Paradoxically, some lecturers were reported to be disinterested in participating in university-organized training programmes. A senior administrator at university x attributed this low interest in the participation of training programmes to increased workload and low motivation, stating:

> *We teach very large classes, and now using technology to design courses and engage students moves you out of your comfort zone. If you are not getting the monetary*

> *incentives needed, it becomes frustrating. So, when you call for training, only a few people show up.*

Undoubtedly, academic workload is a barrier to successful ODDE implementation (Bond et al., 2018; Gregory & Lodge, 2015). This, coupled with the perception of faculty members that the institutional motivation is not commensurate with the increased workload resulting from ODDE implementation, contributes to fostering a culture of resistance and disinterest. As a result, there appears to be a reversion to pre-pandemic practices, as highlighted by a senior administrator at University X:

> *COVID-19 pushed people to embrace online learning, but since the return to normalcy, people are starting to go back to what they are used to.*

On a positive note, one of the universities is attempting to address this challenge by introducing 'Teaching with Technologies' as a category for faculty awards. This practical initiative responds to the findings by Mercader and Guarin (2020), who identified a lack of incentives as one of the key meso-level factors inhibiting the widespread adoption of digital technology in HEIs.

The issue of generational differences as a challenge to DT acceleration has featured in previous studies (e.g., Culp-Roche et al., 2020; Mercader & Gairín, 2020). This generational issue was also observed in this study where the respondents were of the view that younger lecturers were more receptive to contemporary ODDE methods than much older colleagues. This perception was reinforced by a senior administrator who noted:

> *There are people who have been teaching for more than 20 years and they are not ready to use these digital tools if they can avoid it. It is very difficult to convince them to have sustained interest in using them. What we have seen is that the younger lecturers are able to experiment more with the system [LMS].*

An additional human resource challenge is the low retention of expertise in software development and the provision of technical support services. In one of the universities, it was revealed that all software applications used for teaching, learning, and related support services, except for the Moodle LMS, were designed in-house. However, a high turnover of software developers and key technical staff remains a major inhibiting factor to the progress of DT. This has been attributed to the university's inability to match competitive salaries for these specialized skills. A senior administrator in University Y remarked:

> *Imagine that you employ someone to develop a software and see to the deployment of systems. During the project, they get better offers and decide to resign. This has become a cyclical issue and affects our progress.*

Strategic Planning and Policy Gaps

The respondents openly acknowledged the policy challenges that significantly impact their overall digital education climate. They concede that many policies have been reactive rather than proactive. For example, one of the universities only recently updated their 'I.C.T Policy', after over a decade and was still pending ratification by the Academic Board. There was also a notable absence of critical policies; for example, no policy on generative artificial intelligence may somewhat be understandable given its recent emergence, but none of the universities had a mobile learning policy despite the ubiquity of mobile phones and their use for learning. These patterns demonstrate the challenge of slow policy responses in a rapidly evolving technological landscape as corroborated by Teixeira et al. (2021). A senior administrator described the ODDE policy situation in University X as fragmented, stating:

> *We have some policies related to digital education, but the problem is that they are scattered all over the place. Some people talk about the existence of certain policies, but you don't even know where to find them.*

Another notable policy gap is the lack of deliberate policies that address resource allocation and funding for digital education initiatives. Highlighting this challenge, a senior administrator remarked:

> *The funding for investments into technologies is mostly done on an adhoc basis. Funding is a problem everywhere but our budgeting and the sources for funding investments into technology must have a long-term orientation.*

The absence of policy on maintenance is partly responsible for the deterioration of equipment and the consequent impact on the smooth implementation of ODDE, according to several respondents. Citing a specific example, a senior administrator said:

> *Due to the lack of a proper maintenance culture, the upgrading and replacement of equipment could not be carried out [...] and due to the failure of the technologies, the enrolment of students in distance learning programmes did not increase as expected.*

It is therefore necessary to develop and adhere to a strict maintenance policy that addresses all issues related to maintaining digital technologies in the universities.

There were also challenges in the implementation of ODDE policies within universities. For instance, there was no comprehensive implementation guideline for the 70:30 policy introduced in response to the COVID-19 pandemic. It is viewed as more of a directive than a policy as it lacks the necessary guidelines for effective implementation. Rather, the implementation observed is left at the discretion of the lecturer, as one senior administrator at a University X noted:

> *The directive is to encourage Faculty members to meet a minimum of 30% in using online mode for their teaching for campus-based programmes, and 50% for distance learning programmes. I don't think the Departments or Schools have designed any detailed modalities for how it should be implemented.*

Given that effective digital transformation is anchored on a well-defined strategy, it needs to be supported by a robust policy framework to guide its implementation (Carvalho et al., 2022; McCarthy et al., 2023). However, this study's findings echo the concerns raised in previous studies regarding the lack of policy support for DT initiatives in HE (Bond et al., 2018). The Chinese HE system offers a compelling example of how sustained strategic planning efforts yield effective DT outcomes (Xiao, 2023). While university leaders may be personally invested in the digitalisation drive, DT can only take place if the enabling policy framework is put in place with cross-cutting leadership (Hinings et al., 2018; Jameson et al., 2022).

Continuity and sustainability challenges

Another major challenge observed in the universities is the apparent lack of continuity and sustainability plans in some ODDE initiatives, which adversely affects their long-term impact and effectiveness. This challenge is evident as projects are abandoned due to various reasons, including funding difficulties and shifts in priorities among new leadership. For example, a senior administrator at University X spoke on a donor-funded project that was abandoned because the funding period ended:

> *We had a project with a foreign partner to equip all our distance learning centres with modern ICT equipment. The project was implemented in two phases, but when the funding run out, there was no interest in investing the necessary funds to sustain the project.*

Another example cited by a respondent was the provision of tablets and internet data to help distance learners facilitate their learning. However, with the change in leadership at school level, the initiative was discontinued. Other respondents noted some OER projects initiated through donor funding had stagnated since the funding period ended.

RQ3. WHICH SPECIFIC STRATEGIC LEADERSHIP ACTIONS HAVE THE SELECTED UNIVERSITIES UNDERTAKEN REGARDING ODDE, AND HOW DO THESE ACTIONS CONTRIBUTE TO FACILITATING DT?

The study also sought to understand some of the key strategic leadership issues within the universities that facilitated DT. The respondents identified the origins and bedrock of their universities' visions for undertaking DT as a combination of factors such as: (a) existing strategic plans and policies, (b) the digitalisation agenda introduced by their Vice-Chancellors (VC), and

(c) the mandate establishing the university. In all the three universities, the VCs were appointed post COVID-19. Based on the responses, McCarthy et al.'s (2023) six *Leadership* themes were reconfigured to align with the contexts of the universities as follows:

- Vision for digital education
- Strategic planning and institutional policy leadership
- Leader-led initiatives and interventions
- Establishment of specialized ODDE Centers
- Evaluation
- Strategic partnerships

Vision for Digital Education

The respondents highlighted digital leadership as a vital component in the vision for DT put forth by the university leaders. These visions guided the institutions through the DT process and were important in managing change and navigating potential challenges. Within this context, the VCs of the selected universities stood out as exemplary figures for fostering a strong sense of digital leadership at the strategic level. Furthermore, by prioritizing technology integration as a cornerstone of their leadership vision, VCs became the driving forces behind technology implementation across their respective institutions; demonstrating what Jameson et al. (2022) describe as "digital organisational leadership" (p. 15, para 8).

It came to light during the interviews that DT was a top priority on the VCs' leadership agenda. For instance, during the induction speech into office, a VC emphasized a vision of delivering the university's core functions 'driven by technology and anchored in humanism'. A senior administrator in University X explained how a VC reiterated the vision on multiple occasions, underscoring the commitment to transform the university digitally in all its facets. Similar sentiments prevailed in University Y, where the VC's drive and vision to prioritize technology in university operations was emphasized by respondents during the interviews. Indeed, the influence of the VCs in shaping the discourse around technology integration was significant and illustrated by a senior administrator in University Y stating:

> *The Vice-Chancellor has articulated the plans regarding how technology should be at the centre of all that we do here [in the university]. So, everything we do at our level must align with it. It is simply a case of following your leader.*

From the accounts provided by numerous respondents, the VCs embarked on a DT drive in the semblance of a 'pet project'. This means that they had to display traits of transformational leadership to personally drive and carry along other stakeholders towards achieving DT in their respective universities. Previous studies (e.g., Ehlers, 2020; Ordu & Nayir, 2021) have argued that such transformational leadership approaches are necessary for DT.

The complexity of university structures means that cross-cutting digital leadership, and not only from the VC, is necessary to foster DT. In university Y, visionary leadership at the college level was led by the Provost and demonstrated by the college taking the lead on developing audio visual materials to support digital teaching and learning, even before the onset of COVID-19 pandemic. These initiatives enabled the college to achieve a smoother transition from face-to-face to online teaching during the lockdown period compared to other colleges in the university. Similarly, visionary leadership at the School level in university X led to the rolling out of a master's programme in Distance Education and E-learning delivered through the distance-learning mode. Furthermore, a number of graduates from the programme were employed as learning designers in the instructional design team of that and other Ghanaian universities.

Strategic plans and institutional policies

It was evident that the respondents recognized the significance of codifying strategies for enhancing and aligning DT with the university's overall mission and vision. The long-term strategies contained in the strategic plans of the universities usually had a time horizon of between five to ten years and only university Z had a strategic plan that incorporated directions for ODDE towards DT post COVID-19. Another university had developed a new strategic plan

pending approval by its Academic Board. The third university was actively engaged in developing a new one.

The study further found that statutory and adhoc committees played an important role in developing enabling policies to foster successful ODDE implementation. For instance, the universities had statutory technology-related committees as an integral part of their governance structure to advise university management on crafting and implementing technology-related developments. In other instances, special committees were commissioned to generate reports that provided policy guidelines for implementing ODDE initiatives.

Previous research has highlighted the importance of policy documents in establishing the bedrock for technology integration in Ghanaian universities. For instance, Amponsah et al. (2021) cite the "I.C.T. Deployment Committee Report 2014" as the foundation for developing a raft of policy documents for deepening technology integration in the teaching and learning process at the University of Ghana. Attempts to integrate technology into the teaching and learning processes of universities has been an ongoing process; however, the COVID-19 pandemic provided further impetus to quicken the pace of developing digital strategies to maintain competitiveness (Bekele et al., 2021; Rodrigues-Abitia & Bribiesca-Correa, 2021).

An example was when the universities formed ad hoc committees to develop policy framework to guide the transition of teaching and learning to digital environments during the COVID-19 lockdown period. A popular policy that emerged from this period, which is still in effect at all the selected universities, is the so-called "70:30 policy". This policy aimed to ensure that lecturers incorporate online teaching components into their campus-based courses constituted up to 30% of the overall course delivery. Conversely, distance learning programmes were mandated to achieve a 50:50 ratio of online and face-to-face instruction. In explaining the rationale for the "70:30 policy", a senior administrator explained that:

> *Due to the lessons learnt from the Covid-19 pandemic, the Academic Board approved the 70:30 policy to ensure that all faculty members utilize online teaching technologies in their courses. At the moment it is difficult to track the overall effectiveness of the implementation. But I know a number of faculty members who are adhering to it.*

Leader-Led initiatives and interventions

The financial constraints faced by many universities posed a significant challenge to investing in the necessary technologies and infrastructure aimed at deepening ODDE implementation, and ultimately pursuing DT. Respondents indicated that the majority of funding available for technology investments came from annual technology fees levied on students. To address this funding gap, some university leaders have instituted special initiatives. One such ongoing initiative is the *VC's Student Digitalisation Initiative*, implemented in one of the universities, aiming to enhance stakeholder experiences through digitalisation and sources funding from corporate organisations, international bodies, alumni, and the general public. This initiative comprises three components: (1) classroom modernization to change the set-up of lecture halls and incorporate modern digital tools to support technology mediated teaching and learning, (2) the one-student one-laptop (1S1L) project to support needy students with laptops to allow participation in online learning, and (3) hotspot comfort zones to increase access to internet connectivity on the university campus. Such special initiatives happen in different forms in the other universities and were identified as strategies to address at least a *first-level digital divide* within the case universities.

Other strategic initiatives also aimed at increasing stakeholder buy-in and making staff active participants in the DT journey. One such initiative involved organizing special events such as conferences and exhibitions to draw attention of the university community and the general public to ODDE efforts within the university. One of the universities has instituted an annual E-Learning Week to promote awareness of ODDE possibilities and to showcase the university's efforts towards DT. Articulating its strategic importance, a senior administrator in the university explained:

> *E-Learning Week is dedicated to sensitization and mainly to ensure that people have embraced the change that we are pushing for [...] and also to showcase that we have the technology to support teaching and learning and so people should grab it. Change*

is difficult, and especially in our part of the world you need to gradually let people warm into it.

Establishment of specialized ODDE centers

Another significant strategic approach identified as a facilitator of DT was the establishment of specialized centers within the universities to provide critical support for ODDE implementation. The centers were mandated to develop and train faculty, students, and staff on technology-mediated pedagogical approaches, thereby enhancing the quality of teaching and learning in digital environments. Additionally, some of these centers were used as special-purpose vehicles through which academic departments delivered blended and fully online programmes. In two of the selected universities, the centers were established after the COVID-19 disruptions. A senior administrator in University Y noted that:

> *When the new Vice-Chancellor assumed office, a digitalisation transformation committee was established to review the entire digital space within the university. One of the key recommendations in the report is the establishment of this Centre.*

Another administrator in the same university underscored the strategic importance of the center and the leadership role of the VC, remarking that:

> *This Center is an important establishment in our pursuit of becoming the leading university in Ghana and West Africa for digital education. The university has invested a lot of money into its establishment, and we are working hard to exceed all expectations. The VC's direct oversight of this centre reinforces the strategic importance of the Center.*

University X received grant support to establish a Center to support pedagogical and didactical innovations for programmes in the humanities disciplines during the COVID-19 pandemic.

A senior administrator at University Z, which had a center before the COVID-19 pandemic, compared the level of support prior to, and during the COVID-19 pandemic by remarking:

> *The institution has now seen the importance of our center. Previously, it was difficult to get management buy-in to make the necessary investments in the technologies to support the upscaling of technology-enhanced learning. However, when COVID-19 [pandemic] came, they realized how important our center is. Because of the fantastic work we did to roll our programmes online, at least they are gradually providing us with the resources we need.*

As has been noted in previous research, COVID-19 also provided opportunities to demonstrate the importance of ODDE during disruptions of traditiotional face-to-face teaching.

Evaluation

Evaluation is critical to measure DT outcomes as there is increasing scrutiny on the evidence of learning improvements through technology (e.g., Haleem et al., 2022; UNESCO, 2023; Xiao, 2024), However, the examination of evaluation themes revealed a lack of depth and a lack of focus on quality assurance processes within digital teaching and learning environments. The traditional approach of soliciting feedback from students to gauge the quality of teaching and learning experiences as done in traditional campus-based modes tended to be the most prevalent. Respondents also drew attention to the role of audits conducted within the Learning Management System (LMS) to review user interactions and to subsequently tailor faculty training programs. Also, at the departmental leadership level, one of the universities implemented initiatives such as counselling services and improved communication channels between students and lecturers using technology; this initiative was informed by research conducted by the department's academics on support services for blended learning.

Strategic partnerships

The selected universities were observed to be deliberately cultivating relationships with entities such as technology organisations, international universities, industries, and experts through leader-led efforts. These partnerships were aimed at facilitating knowledge exchange,

technology transfer, and collaborative research opportunities within the context of facilitating the DT of the universities. Partnerships with large international entities such as the Mastercard Foundation, Microsoft, and Andrew W. Mellon Foundation represent just a few examples of fruitful relationships that contributed to the universities' DT efforts. Indeed, previous studies (e.g., Habib, 2023) have demonstrated how strategic partnerships can prove beneficial for the DT of universities in challenging contexts.

An interview revealed an example of such strategic partnerships called *Building Stronger Universities (BSU) initiative*,[2] which is a consortium of Danish Universities and six African universities, two of which are public universities located in Ghana. The BSU provides a platform for capacity building in the area of policy development and funding to support initiatives including digital education. In another example of knowledge and technical exchange prompted by the COVID-19 pandemic, a senior administrator remarked that:

> *We [the university] recently signed an agreement with a university in Estonia to support our online learning endeavours. A team from our university visited them to learn best practices regarding online learning.*

As noted by Svenson et al. (2024), and Mercader and Gairín (2020), international collaborations of these sorts have proved to be important drivers for DT.

However, there were also instances of strategic partnerships geared towards ODDE that existed before COVID-19. In highlighting the successes of a previous partnership, a senior administrator in University Y recounted:

> *Even before COVID-19, we had started some initiatives to scale up the integration of technology for the distance learning delivery modes. The university had a partnership with the Chinese government to install technologies in almost all the university's learning centres, including the purchase and distribution of laptops to Lecturers teaching on the distance learning programmes.*

CONCLUSIONS AND IMPLICATIONS

This study explored leadership responses and actions that facilitate ODDE implementation towards the DT journey of public HEIs in a digitally challenged context. It became clear that the universities' efforts to intensify ODDE pre-date the COVID-19 pandemic and places the selected universities into Bekele's (2021) *Transformationalists* category based on their COVID-19 responses. However, it was evident that the pandemic served as a stark demonstration of the necessity of enhancing ODDE and deepening awareness of the transformative potential of digital technologies in education, as was observed in many HEIs around the world.

The study further found that the universities' DT objectives were driven by their need to respond to the changing needs arising from the digital age and demand for HE. These responses contained multiple facets including enhancing existing teaching and learning practices, shifting from manual to automated processes in administrative and academic support services, and creating new opportunities for widening access through new programme and delivery modalities. However, these DT objectives mostly align with the concept of digitalisation (Fernández, 2023; Reinitz, 2020), highlighting the ongoing confusion surrounding the usually interchangeable terms of *digitisation, digitalisation, and digital transformation*. While digitalisation is a crucial aspect of the DT journey, it does not involve a fundamental shift in the value proposition of the institution (Brown et al., 2020; Vial, 2019).

Inspired by McCarthy et al.'s (2023) synthesis which derived six leadership dimensions from DT frameworks, the present study configured and related the leadership dimensions to ODDE implementation as the key levers for facilitating DT in the case universities. These were*: (1) vision for digital education; (2) strategic planning and institutional policy leadership; (3) leader-led initiatives and interventions; (3) establishment of specialized ODDE Centers; (5) evaluation; and (6) strategic partnerships*. The efforts tended to be driven primarily by the VCs and geared towards university-wide digitalisation in a manner akin to "heroic digital leadership" (see

2 https://dfcentre.com/building-stronger-universities-bsu/.

Collinson, 2020). While such approaches highlight the role of the VCs as DT change agents (Cortellazzo et al., 2019), the necessary enabling strategic and policy frameworks to facilitate the DT process were generally fragmented, ad hoc, reactive, and often lacking in clarity, which partly explains why evaluation was found to be the weakest leadership dimension. Additionally, other critical contextual challenges including first-level and second-level digital divides, low technology infrastructure, human resources, and continuity and sustainability challenges posed serious threats to accelerating these efforts. Furthermore, there were already signs of a reversion to pre-pandemic practices, suggesting weak signals of sustained change due to policy gaps. Additionally, the study found minimal evidence of cross-cutting digital leadership culture and largely lacking in a balanced approach to DT that incorporates both bottom-up and top-down strategies, despite its proven effectiveness for DT (Ruloff & Petko, 2021; Schallmo et al., 2019).

The identified material, human, and technological challenges in this context perhaps explains why strong leadership from the VC level is required to push through DT efforts. However, there is the need for university leaders to foster a governance climate that accommodates bottom-up approaches for DT. This entails driving initiatives from the unit, department, school/faculty, or directorate level, so that the initatives align with their strategic needs and capabilities. Success in DT can then be accurately measured and improved at these sub-structural levels, fostering numerous initiatives that could coalesce into a comprehensive university-wide DT effort. Other recommendations for university leaders in Ghana and similar contexts to enhance leadership actions towards DT might include:

- re-structure ODDE-related and support units engaged in implementing digitalisation initiatives in a more coordinated and intentional effort. This could also involve providing a focal point by designating a Chief Digital Officer to oversee all DT initiatives.
- ensure that digital leadership is cross-cutting, and must permeate all levels of leadership, backed by necessary authority to allocate resources.
- leverage on the motivation derived from the pandemic-induced innovations to encourage staff to sustain ODDE efforts through recognition and reward schemes, including pathways to promotion.
- intensify collaboration efforts with other universities faced with similar contextual challenges to share ideas, resources, and/or infrastructure.
- leverage influential coalitions such as Vice-Chancellors Ghana[3] to work collaboratively with HE regulators and government actors to set a DT agenda for public HEIs in Ghana.

The study further argues that the historical and structural factors that affect transformation within digitally challenged contexts must be taken into consideration when conceptualizing DT. This requires drawing on the DT leadership skills of DT awareness, DT acceleration, and DT harmonization as proposed by Hanelt et al. (2021). This means university leaders must pursue targeted digital transformation initiatives by reflecting on what the institutions deem meaningful based on the resources available while addressing the systemic challenges. To illustrate, the installation of smart lecture halls as observed in some universities enables hyflex mode of instruction which addresses issues related to large class sizes. As this upgrade might typically fall within the *digitalisation* categorization (Fernández et al., 2023; Reinitz, 2020), this in fact, represents value addition, and transforms a process to what previously existed and as such qualifies as DT in such circumstances. By contextualizing DT, it prevents the possible creation of another divide label such as a 'digital transformation divide'. A one-size-fits-all-approach risks marginalizing institutions with fewer resources.

Future steps may entail comparing public and private HE leadership actions, and validating the leadership action themes through a large-scale quantitative survey, gathering insights from key stakeholders such as students and faculty to discern the influence or contribution of each theme. Additionally, further scientific inquiry is warranted into other dimensions of DT essential for HE development, including quality assurance, support services, and the nature of digital assets for ODDE implementation in resource-constrained contexts.

3 https://vcg.edu.gh.

DATA ACCESSIBILITY STATEMENT

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

ETHICS AND CONSENT

An ethics review was not applicable. However, informed consent was sought from all respondents before interviews were conducted.

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COMPETING INTERESTS

The author has no competing interests to declare.

AUTHOR CONTRIBUTIONS (CREDIT)

Frank Senyo Loglo: Conceptualization, Data curation, Formal Analysis, Methodology, Writing – original draft, Writing – review & editing. The author has read and agreed to the published version of the manuscript.

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This paper was proofread, edited, and refined with the assistance of OpenAI's GPT-3.5(Version as of February 20, 2024), and DeepL Write software, complementing the human editorial process. The human author critically assessed and validated the content to maintain academic rigor.The author also assessed and addressed potential biases inherent in the AI-generated content. The final version of the paper is the sole responsibility of the human author.

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