

Digital Transformation for Higher Education in South Africa

Subjects: Others

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COVID-19 has left an unmistakable impression on the world stage. It has altered the global socio-economic landscape, forcing individuals to adapt and embrace new ways of doing business, as well as new ways of life. One of the most significant effects of the pandemic was to hasten the adoption of digital technologies by many areas of the global economy. Campus closures were observed in the higher education sector, putting an end to long-standing face-to-face teaching and learning. This necessitated the most rapid paradigm shift ever seen in this industry to continue educating and learning. An abrupt change to online learning, which is primarily reliant on digital technologies, occurred.

Keywords: digital transformation ; higher education ; digital technologies ; South Africa

1. Introduction

There have been some global pandemics similar to COVID-19 in the past, and among them were the Spanish flu in 1918 and the swine flu in 2009. According to Hickok ^[1], these pandemics were deadly. However, in the United States of America, generally, the swine flu had a mortality rate of 0.02% between April 2009 and April 2010, whilst, in the same country in 2020, the mortality rate of COVID-19 was 2%, which is 100 times higher than that of the swine flu. These statistics substantiate the fact that the aftermath of COVID-19 is the worst ever in the recent history of the world ^[1]. Having rapidly spread over the entire globe, the pandemic made an indelible mark on all facets of life, hence forcing people to adjust and embrace new ways of doing business, as well as changing ways of life. One of the major things that this pandemic did was to speed up the adoption of digital technologies by many sectors of economies across the globe. Before the outbreak of this pandemic, the digital transformation had already been witnessed in different sectors but at a slow pace, particularly in most developing economies, with South Africa included ^[2].

Amongst the different sectors impacted by COVID-19 is the sector of higher education. This sector is one of the most important sectors of any economy because it contributes to socio-economic development through developing human capital, researching and developing knowledge, spreading and using knowledge, as well as storing and transmitting knowledge ^[3]. One of the precautionary measures that were put in place to arrest the rapid transmission of COVID-19 was social distancing, and, to achieve this, there was a directive from governments to close campuses of institutions of higher learning the world over ^{[4][5]}. This measure became a great setback to the sector as it suddenly shifted physical classroom teaching to online platforms ^[5]. Online teaching and learning require digital technologies, such as learning management systems (LMSs), appropriate gadgets, and internet connectivity, among other things, for effective teaching and learning to happen. Examples of learning management systems include Blackboard Learn, Moodle, Google Classroom, and Adobe Captivate. Rashid et al. ^[6] indicated that COVID-19 brought to the fore the deficiencies in the sector of higher education. Therefore, the outbreak of the pandemic brought a rude awakening to higher education. From this sudden shift in ways of doing things, the sector had lessons to learn concerning digital transformation.

2. Digital Transformation in Higher Education

The term digital transformation has numerous definitions, and one of them by Hanelta et al. ^[6] presents it as "organizational change that is triggered and shaped by the widespread diffusion of digital technologies". However, Ziyadin et al. ^[7] and White ^[8] share the view that the concept results from the amalgamation of individual and firm IT conditions and encases the transformative consequence of the latest digital technologies, such as social, mobile, analytical, cloud, and the IoT (SMACIT). The concept is also broadly viewed as the combination of digital technologies and business processes, as well as the application of innovation to radially intensify the implementation of business undertakings in a digital economy ^{[9][10]}. The common key issue regarding digital transformation from all the above views is that there is some harnessing of digital technologies by organisations to achieve business objectives. Digital transformation would be

depicted as the process of deploying digital technologies in the higher education sector to transform traditional teaching and learning.

The recent paradigm shift in the higher education sector is a scenario where digital technology is envisioned as an interconnected complex environment that allows online teaching and learning ^[11]. The shift has seen teaching and learning being conducted virtually on digital platforms that are heavily supported by digital educational technologies. Examples of educational technologies include LMSs, namely Moodle and Google Classroom, online collaboration spaces, such as Zoom and Teams, AI-generated applications, Google Chromebooks, MacBooks, laptops, iPads, and tablets. From these examples, Bui ^[12] indicated that the largest educational technology trends in the year 2019 before the COVID-19 pandemic were machine learning, big data, and IoT. However, the outbreak of the pandemic in 2020, during which students had to learn through digital platforms, saw another trend of technologies being embraced to suit the shift. According to Bui ^[12], the 2020 and 2021 educational technologies included “e-learning, video-assisted learning, blockchain, big data, AI, learning analytics, gamification, virtual and augmented reality, and social media learning”.

The World Bank ^[13] has commended all countries for being able to employ virtual teaching and learning technologies that compounded TV, radio, mobile, and online platforms. However, it was noted that many students from low-income countries could not take part in virtual teaching and learning. Against this backdrop, the World Bank is engaging countries to address critical issues in distance teaching and learning, and the issues include procurement of devices, cloud solutions, affordable connectivity, and multi-modal conveyance of teaching and learning ^[13].

3. COVID-19 and Higher Education in South Africa

Higher education was defined by Abad-Segura et al. ^[14] as “all types of studies, training or research training at the postsecondary level, provided by universities or other educational establishments that are approved as institutions of higher education by the competent state authorities”. The concept embraces all activities deemed higher education by a particular jurisdiction, and these are conducted within universities, postgraduate schools, polytechnic colleges, and technical vocational education and training (TVET) colleges whilst targeting a wide variety of students. UNESCO is mandated at the global level for higher education, hence facilitating the enactment of experientially based higher education policies ^[14].

The sector of higher education in South Africa consists of 26 public universities, 50 public TVET colleges, and various private institutions. According to Ref. ^[15], the student enrolment in 2017 was nearly one million in public universities, 700,000 in the 50 TVET colleges, and 90,000 in various private institutions. The country had experienced a sharp increase in student enrolment from 1994, not only in numbers but also on a racial basis. Most students in these institutions are now Africans, and the government provides funding through the National Student Financial Aid Scheme (NSFAS) bursary. The Department of Higher Education and Training funds this bursary project for those students who cannot fund themselves and have no access to other bursaries, study loans, or bank funding ^[16]. Tjønneland ^[15] argued that, despite the sharp rise in student enrolment in higher education institutions, it was believed that the enrolment was still far too low compared to the country's population of 55 million back in 2017. However, Tjønneland ^[15] highlighted that the government had plans to raise the enrolment of students to 1.5 million by the year 2030.

The COVID-19 outbreak in South Africa dawned when some public universities had challenges due to the students' protests that were going on over the rising tuition fees, disgruntlement with accommodation and registration, among other issues ^{[17][18]}. Furthermore, some of those protests had turned vicious, resulting in provisional shutdown of some institutions of higher learning ^[19]. The onset of the pandemic worsened the situation as the closure of all higher education campuses during the lockdowns was announced on 18 March 2020. This saw a total shift from the old face-to-face education practised in the majority institutions of higher learning to the online teaching and learning ^[20]. Whilst traditional classroom teaching and learning used books, chalk, and chalkboards, the online mode avails module content online using digital technologies, such as computers, laptops, tablets, and smartphones, as well as LMS, software applications, and social media sites ^[20].

The lockdown situation was being monitored by the government and updates on the opening of campuses were communicated at the different levels of lockdowns. In May 2020, university campuses were opened to allow up to 33% of the students to return to campus and university accommodation under lockdown alert level 3 ^[21]. Priority of returning to campus under the 33% was given to final year students who needed to use laboratories, technical equipment, internet, as well as accessing university accommodation; postgraduate students who also required technical equipment for their studies; and all students that required clinical training as part of their programmes; as well as those who faced utmost

difficulties learning from their homes ^[21]. Still, this return of students on campus did not come with the re-introduction of face-to-face teaching and learning to full capacity in universities countrywide.

For TVET colleges, the dates to return to campuses were staggered for different disciplines and different levels of study. The programmes and levels were grouped as follows: engineering students N6 and N3; N5 and N2; and N4 and N1 with different dates of returning in June and July 2020. For business studies students, each of the following levels had its returning date: the N6, N5, and N4. All academic staff for TVETs were set to return by 8 June 2020 ^[21]. This return had seen a loss in teaching and learning time of about two and a half months from the time the hard lockdown was announced. The return of students on campuses for TVET colleges brought back the long-established face-to-face teaching and learning to a greater extent as compared to universities. Examination dates were postponed to the following year, 2021, to allow the 2020 academic year to fold.

When the country moved to lockdown alert level 2, Higher Education announced the return of up to 66% of students ^[22]. The return was meant to allow for increased access to face-to-face teaching and learning by more students. However, this arrangement could still not allow universities to revert to face-to-face teaching and learning as the rest of the students would continue with online teaching and learning. Assessments were also conducted online.

It was only in 2022 at the beginning of the academic year that all students came back to university campuses in all the public universities in the country. However, most universities have introduced blended teaching and learning. This implies that students would have both online and face-to-face education to reduce overcrowding in the lecture rooms despite all students being allowed on campus. The re-opening of campuses to all students in 2022 has seen a few universities being declared vaccination mandatory sites, where all students and employees would be required to be vaccinated for them to access university campuses unless they have an approved exemption.

South African history is dominated by inequalities, a situation that raises feasibility questions to the introduction of online learning ^[20]. Whilst Mpungose, Mzangwa and Bunting ^{[20][23][24]} agree that much has been accomplished since 1994 to rectify the inequalities through amendments to the higher education institutions' policy, the efforts have not yielded reasonable benefits for most of the Black South African students who were previously underprivileged. This will still impede their access to the online platform of learning. Further to the historical inequalities, the digital divide is believed to be an immense limiting factor to the feasibility of online teaching and learning in South Africa ^{[20][25]}. Literature has indicated that there are socio-economic factors that control the extent of the digital divide in a university setup. These factors are race, gender, social class, age, academic background, and geographical location ^[23]. In South Africa, the intensity of these socio-economic factors that caused the digital divide is high and, consequently, the universities in the country are still struggling with internet and computers access as compared to American and European universities ^{[20][25]}.

Research has indicated that, to redress the digital divide, Western countries have developed diverse programmes, as well as policies to provide university students with free laptops and free WiFi on campuses and halls of residence, but research is scarce in this area in South Africa ^{[20][26]}. There is also a scarcity of research that has been conducted for South Africa to redress the digital divide challenges that impede university students to access online teaching and learning from their homes. Mpungose ^[20] argues that online education cannot be accomplished in South African universities unless the digital divide is redressed. To compound the argument of Mpungose ^[20], Nikoubakht and Kiamanesh, Liu and Long ^{[27][28]} further argued that, despite the digital transformation's dictates to deploy online learning, it is not possible to replace face-to-face education because it is the foundation of learning institutions. However, some researchers perceive that there is a quandary between online and traditional face-to-face teaching and learning ^[20]. Some researchers, such as those in Bates, Anderson ^{[29][30]}, regard blended learning as a solution to the quandary as it combines both, including face-to-face education, a mode that allows students more ways of accessing learning material depending on their affordability or their side on the digital divide.

The sudden shift to online learning has its share of challenges. One of them is the forced adoption of new teaching pedagogies by the teaching staff in universities without a clear blueprint for meeting students' learning needs ^[5]. This meant a great deal of experimenting by university lecturers as they lacked training in effective online teaching and learning before the sudden shift. This scenario strongly suggests the need for lecturers' training, which might make way for collaboration among educational technology providers, online education firms, and universities in the post-pandemic era ^[5]. Since COVID-19 has laid bare the weaknesses of the current system of higher education, the South African government should increase its commitment and invest more in professional development programs that capacitate university lecturers.

4. Connectivism Theory

According to Denhere and Moloi ^[31], educational technology has been on the rise for the past 50 years and is becoming critical in all aspects of education. The interest by researchers in the intellectual processes behind human learning processes led to the formulation of various teaching and learning theories that would explain how learners should be taught ^{[31][32]}. Some of these theories are multiple intelligence, behaviourism, cognitivism, and constructivism, and it is from these that various educational-technology-related theories were developed ^[33]. Examples of educational-technology-related theories include connectivism, anchored instruction, innovative diffusion, and experiential learning.

From the above theories, the focuses are on the connectivism theory because it is the most relevant as it is influenced by technology. This theory was initially coined by George Siemens in 2004, who described it as a new learning theory that is massively influenced by technology ^{[31][34]}. It then became the theory of the digital era. According to Abad-Segura et al. ^[14], connectivism theory provides new insight into what it takes to facilitate online education in a continuously evolving digital world. The theory explains the role of internet technologies in creating new opportunities in teaching and learning, as well as sharing information across the world wide web ^[31]. Furthermore, Anderson ^[30] posited that the connectivism theory promotes the use of search engines and social media by students for them to be able to explore the world as they connect with other external people during the learning process. Siemens ^[35] posited that connectivism is steered by the apprehension that information is a network that is frequently acquired and upgraded. Furthermore, the theory is anchored on the understanding that online peer networks, such as social media sites and online platforms, are indispensable in e-learning experiences.

According to Fiore ^[34], one view of learning in connectivism is the knowledge of where to find information, as well as the ability to recognise connections that exist between ideas, topics, and concepts, and this is very critical in e-learning. Denhere and Moloi, Fiore ^{[31][34]} share the view that the connectivism theory is centred on the fact that students can obtain frequently updated new learning content material, as well as pick out acceptable resources. Furthermore, the theory liberates the students from the outdated cognitive practices of acquiring knowledge through receiving instruction, study, and experience and channels them towards allowing technology to become part of their internal learning process. Whilst connectivism has different facets, as outlined above, Abad-Segura et al. ^[14] indicated that the fundamentals of this theory are grounded in the reality that knowledge and learning acknowledge the multiplicity of viewpoints and that the relationship that exists between sources of information is given priority to allow continuity of learning.

Students are considered to be active participants in teaching and learning and not as acquiescent recipients of information as they can make their way across network connections to acquire, employ, as well as share information ^{[20][36]}. This view is supported by Duke et al. ^[36], who identified guiding principles under this theory. Mpungose ^[20] posited that these guiding principles are grounded in the following learning basic principles to integrate content and social learning experiences: constructivism, behaviourism, and cognitivism. Unlike traditional learning, learning in the digital transformation era is individually and socially established by students to support diverse ideas ^[20]. Mpungose ^[20] posited that, under the connectivism theory, effective learning is supported by the availability of internet connectivity and technological resources both in the students' homes and on campuses. Therefore, higher education institutions should ensure that students can access the internet and also have proper gadgets to enable their meaningful participation in the teaching and learning supported by educational technologies.

5. Digital Transformation for Higher Education in South Africa

The new experiences ushered in by COVID-19 across all sectors of the global economy created research opportunities. Various research studies were conducted to establish the consequences of the pandemic on the higher education sector. Marinoni ^[37] conducted a survey on the impact of COVID-19 on institutions of higher learning globally through the International Association of Universities initiative. The survey was conducted to obtain a better understanding of the disturbances caused by the pandemic on institutions of higher education globally. The survey also aimed at investigating the first measures implemented by institutions of higher learning in their response to the crisis. Approximately 9670 higher education institutions were contacted to take part in the survey globally, but findings were based on 424 complete responses from the unique institutions of higher learning in 109 countries, as well as in two distinctive administrative regions of China, namely Hong Kong and Macao. An analysis of the results was conducted regionally as well as globally.

The results from this survey were based on the following themes: infrastructure set up to communicate with both the students and employees; impact on enrolment; being consulted for public policy development; government and ministry of higher education support; partnerships; teaching and learning; important opportunities; international student mobility; virtual mobility; conducting assessments; research; and community engagement.

The following are findings for each of the above themes from the survey. Ninety-one percent of the higher education institutions (HEIs) had infrastructure set up to reach out to both their students and employees regarding the pandemic; 80 percent of the HEIs believed that COVID-19 affected the enrolment, with 46 percent believing that the impact would affect both local and international students, with an ultimate effect on finances. About two-thirds of the HEIs indicated that their senior management, as well as faculty, had been contacted by public officials concerning COVID-19 public policy development. Forty-eight percent indicated that their governments, through the ministries of higher education, supported them to mitigate disturbances from the pandemic; 50 percent reported a weakening of partnerships; while 18 percent reported the strengthening of partnerships; and 31 percent reported that the pandemic led to the creation of new partnerships. The pandemic affected teaching and learning at the majority of HEIs, and two-thirds indicated that face-to-face education was substituted with distance education, where challenges to access technical infrastructure, competencies, and pedagogies were experienced. It was also found that distance education came with good opportunities, such as more adaptable learning chances, exploration of blended learning, and mixing of synchronous with asynchronous learning. Additionally, 89 percent reported an impact on international student mobility. It was also found that new measures for conducting assessments had to be put in place due to the pandemic. Research was also affected, with 83 percent of HEIs indicating that there was the cancellation of international travel, 81 percent reporting cancellation or postponement of scientific conferences, and 52 percent reporting that scientific projects were in peril of not being completed. Finally, the findings also indicated that community engagement projects for the majority of HEIs were affected. For this finding, just less than half indicated that the pandemic increased their community engagement, while just below a third indicated that COVID-19 decreased their community engagement activities.

Toquero ^[38] conducted a study on challenges and opportunities for higher education in the middle of the pandemic in the Philippines. The research discussed how higher education was affected by the pandemic, as well as how it could tackle similar challenges in the future. It was grounded on the researcher's experiences, literature review, observations, and COVID-19 guidelines. The study came up with the following recommendations for higher education: integration of environment and health learning modules in the curriculum to enable the curriculum to become reactive to the world needs when pandemics strike; strengthening of environmental policies and hygiene practices to prevent the outbreak and spread of communicable diseases; incorporation of virtual mental health and medical services to promote continuous monitoring, as well as the discharge of health practices within and outside the academic institutions; migration of modules to align curriculum capabilities, as well as increasing academic staff training for online teaching and learning instruction to speed up response for continuity of learning; and strengthening of research efforts, monitoring of data, and evidence-based practices to enhance education.

Pokhrel and Chhetri ^[39] conducted a literature review to provide a comprehensive account of the COVID-19 impact on online education based on various papers indicating the way forward. It was acknowledged that the dearth of research on the deficiencies of online teaching infrastructure, the restricted exposure of academic staff to online teaching and learning, the information gap, unproductive learning environment at home, and equity in the higher education sector. It was concluded that, whilst there is evidence of research that was conducted elsewhere, there is a need for more exploration on appropriate teaching instruction in developing countries.

It was also concluded that many developing countries had low internet bandwidth and costly data packages, consequently making accessibility and affordability insufficient, hence calling for intervention at the policy level. Further research on effective online education pedagogy and the need for developing authentic assessment tools were recommended. It was also recommended investing in the professional development of academic staff, particularly in ICT and effective teaching and learning instruction. Finally, the lesson learnt from the pandemic was that both the academic staff and students should be trained on how to use various online educational tools were highlighted.

Another study was conducted in Said ^[40] to explore the consequences of an unexpected move from previous face-to-face to online education because of the lockdown at an Egyptian university. The study involved a comparison of sampled students who had finished a face-to-face module in one season in 2019 against another sample of students who finished the same module online in the same season in 2020 during a lockdown period. Statistical analysis was conducted to compare performance grades, as well as grade distribution for the two groups. Furthermore, the effect of gender, age, and credit hours were also assessed, and the findings indicated an insignificant statistical difference in the students' grades. The study also established that the unexpected rapid shift to online education at the onset of COVID-19 did not lead to a substandard learning experience, hence dispelling what was anticipated.

The study made recommendations for higher education institutions, academic staff, and higher education portal designers. For higher education, some of the recommendations were: the provision of support to academic staff to create interactive online teaching and learning materials, enhancing internet bandwidth, increasing data centres' capacity,

procurement of authorised e-learning tools, as well as training both students and academic staff on the required IT skills, providing students with efficacious and reactive technical support and troubleshooting services for use during assessments, and providing 24-h support to both students and academic staff through the use of telephone calls, e-mails, virtual live chat, and video guides. For the academic staff, it was recommended that they make a strong effort to design online modules instead of transferring the face-to-face module content onto the online platform, emphasize interactivity and feedback during online sessions to promote students' attendance using virtual chat rooms, and provide clear assessment instructions to students.

For the portal designers, it was recommended that the learning management portal should include high levels of interactivity for academic staff and students. This could be achieved using blogs, message boards, and chat rooms, among other things. These tools would support the students in need of help and promote the retention of students. Higher education students' portals should also employ interactivity tools to extend the students' learning experience, as well as the mobility feature of the portal. The mobility nature of the portal enables students to access learning content with different gadgets from different places with the use of different forms of internet connectivity. The portal should also have the e-mentoring feature to make up for the on-campus support mechanism that would assist students by providing additional resources.

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