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Covid-19 and the virtual classroom conundrum in Zimbabwean universities

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Abstract

Whilst the virtual classroom has become the most tenable alternative to address educational needs under the circumstances of the Covid-19 crisis, most universities in Zimbabwe have been found wanting—lacking responsive information communication technology (ICT) infrastructures and techno-savvy human capital. This exploratory study employed in-depth telephone interviews with five purposively sampled deans, lecturers, and disadvantaged students—one each from each of five universities (three state, and two private). Forty more students for five focus group discussions were selected through stratified random sampling. Our study adopted a qualitative approach to collect, present, and analyse data. The key finding was that Covid-19 has certainly amplified the digital divide and preexisting inequalities in institutions of higher education, particularly in developing nations like Zimbabwe. Further, the study revealed that a techno-based curriculum delivery approach becomes discriminatory and intensifies social exclusion because some students living in poverty struggle to access the e-learning resource materials. In Zimbabwe, the situation has become dire and complicated because of the economic meltdown prevailing in the country. Universities as service institutions are thus encouraged to invest heavily in ICT infrastructure, and the government to subsidise the cost of internet bandwidth and data bundles to enable students to access the e-learning materials.

Keywords: Covid-19, virtual classroom, social distancing, techno-based pedagogy, digital divide, e-learning

Background

Bekker and Carrim (2021) observed that the education sector in South Africa has been severely affected by the Covid-19 pandemic through the closure of schools, colleges, and universities. Zimbabwe lies in the same Southern African region as South Africa and has been equally affected by the pandemic and the resultant closure of educational institutions. Institutions of higher education in Zimbabwe were closed due to the Covid-19 pandemic in March 2020, just two weeks after they had opened for the first semester—disrupting the entire learning systems of university education in the country. Thereafter, there have been intermittent closures of universities. This study interrogated the preparedness of information communication technology (ICT) infrastructure in Zimbabwean universities to deliver virtual curricula and pedagogies in the wake of the Covid-19 crisis. It was carried out at the end of 2020 and spilled into the first quarter of 2021. It explored the emerging learning challenges and prospects as much of curriculum delivery moves to online platforms.

According to a report by Zimbabwe National Statistics Agency (2020), there are currently 16 universities in Zimbabwe (five private and 11 public); the same report reveals that there are 92,276 students in Zimbabwean universities (43,589 males and 48,875 females). Although there are more female students in universities, of those studying science-related programmes, only 40% are female. Students pay fees and in private universities the fees are higher, explaining why there are depressed student populations in private universities.

Murgor (2015) conceptualised ICT as an umbrella term that includes any communication device or application encompassing radio, television, cell phone, and computer and network hardware and software. In this context, a virtual classroom is perceived as a teaching and learning environment located within computer-mediated communications where students participate in synchronous instruction (Duţă & Martínez-Rivera, 2015). Thus, the availability of ICT provides an opportunity for e-learning and virtual classrooms in education institutions. A study by Fataar and Norodien-Fataar (2021) in South Africa suggested that online education via digital technology should now be central in addressing ongoing educational access and outcomes challenges. This suggestion also applies to Zimbabwe because Zimbabwe was equally affected by the Covid-19 pandemic. Our study argues that while e-learning becomes the most valuable option to address education needs under the circumstances of the Covid-19 pandemic, in which social distancing is encouraged, it concomitantly intensifies social exclusion by discriminating against some students who are living with disabilities, and others who come from poverty-stricken backgrounds. It is against this backdrop that the study interrogated the preparedness of local universities to offer online tuition.

Covid-19 is a pandemic that took the world by surprise, leaving many health experts and scientists confounded. It was first discovered in the city of Wuhan in China in December 2019 and declared a global public concern by the World Health Organisation (WHO) on 11 March 2020 (WHO, 2020). It spread through the whole world with the United States, Italy, Spain, United Kingdom, France, and China being the most affected statistically (Jakovljevic

et al., 2020). The university calendar has been disturbed several times because universities were closed in an effort to contain the coronavirus. Instead of having the normal two semesters in the 2020 academic year, the erratic learning time allowed for only one semester. The same happened for the 2021 academic year, and the second semester spilled into 2022 for most institutions due to the Covid-19 induced lockdowns.

In South Africa, Fataar and Norodien-Fataar (2021, p. 158) observed that "digital technology has been a ubiquitous, albeit uneven, feature of educational platforms for at least forty years, growing exponentially over the last twenty." The Zimbabwean situation with regards to digital technology appears to be different because there are hardly any institutions (urban or rural) with a sound ICT infrastructure due to the prevailing economic crisis (Maunganidze et al., 2021). Further, a study carried out in Europe by Martin et al. (2021, p. 2) revealed:

> Although the teaching and learning processes in higher education were already in continuous evolution in relation to the influence of technology on the incorporation of emerging methodologies, the truth is that due to the confinement caused by the coronavirus it seems the full use of ICTs in methodological adaptation has been enforced and its inclusion accelerated, as a test of organisational agility.

Thus, due to the spread of the virus, ICT has played a prominent role during the crisis (Monzón, 2020). The pandemic resulted in the lockdown of most countries affecting the education systems of those countries disproportionately due to the existing digital divide between developed and developing countries of the globe.

The digital divide is the unequal provision of opportunities to access ICTs due to the differentially developed ICT infrastructures in various countries (Owen et al., 2020). In developed countries, particularly in the US and Europe, e-learning has become the norm with some academic programmes being offered entirely online. Martin et al. (2021) observed that many European university students use ICT daily and seamlessly for both their studies and for recreation. Murgor (2015) underscored that ICT has grown tremendously around the globe, particularly in the developed nations. Martin et al. (2021) concurred, and add that e-learning has become the norm in the US and other developed nations because web technology has been available for more than 20 years. To this end, Fataar and Norodien-Fataar (2021) observed that a pandemic pedagogy based on the rapid move to emergency remote teaching (ERT) has starkly revealed the depth of the digital divide in South Africa and the world. Hodges et al. (2020, p. 3) explained emergency remote learning as follows:

> A temporary shift to alternative delivery modes that would return to face-to-face instructional delivery once the emergency had passed: it is meant only to be an emergency response to an emergency situation.

ERT has not always been possible because of a lack of responsive ICT infrastructure. And in the same vein, Zheng and Walsham (2021, p. 1) argued:

> The Covid-19 pandemic has unveiled and thrown a spotlight on deep-seated inequalities. . . . Under the pandemic, existing socio-technical discrepancies are often magnified, and diverse forms of exclusion, marginalization and vulnerabilities emerge.

Such observations of digital divide and socio-technical discrepancies are also applicable to Zimbabwe, a developing country suffering from serious economic and political crises. The literature has shown that much of the learning in developed nations has moved to online platforms, thereby confirming the existence of a conspicuous digital divide between the Northern and Southern countries (Martin et al., 2021; Murgor, 2015; Owen et al., 2020). By extension, the education systems in developed countries have made a seamless transfiguration—becoming entirely virtual in the wake of the Covid-19 pandemic that encouraged lockdown and social distancing (Martin et al., 2021). However, this has not been the same in developing countries. The untimely emergence of the Covid-19 pandemic provided an acid test for the ICT infrastructure and human capital in Zimbabwe's universities.

The digital divide between developed and developing countries has remained conspicuous as Africa continues to struggle with poverty. To this end, Sayed et al. (2021) observed that Covid-19 has certainly amplified preexisting inequalities between the Global North and South but it is unclear how this crisis differs from other crises. Although ICT provides unprecedented opportunities to fight against poverty in developing countries by facilitating access to education (Owen et al., 2020), the high cost of broadband internet access remains a major deterrent to African countries' broadband penetration rate. In the wake of the Covid-19 crisis, Zimbabwe's educational infrastructure network and its ability to sustain the implementation of e-learning platforms has come under the spotlight.

A study by the United Nations Children's Fund (Kleine et al., 2014) revealed that many developing countries were largely excluded from ICT and its benefits because of poverty. Furthermore, the 2011 internet penetration rates in Africa and Asia were just 11.4% and 23.8% respectively—both less than the world average of 30.2%; and, only 1.2% of the population in the least developed countries had access to the internet (Touray et al., 2013). Under such circumstances, the implementation of ICT in developing nations was nonviable due to the high bandwidth requirements to support communication tools including voice and video conferencing, a shared whiteboard, instant messaging, and file sharing (Ruhinda, 2013). Murgor (2015) concurred and added that Africa's ICT situation was worsened by the fact that the African continent lacked a continent-wide broadband optical fibre network, which made access to ICT more difficult for most African countries. Moreover, the issue of integrating ICT into teaching is yet to be given serious consideration by many developing nations of the world, particularly in Africa where many countries do not have national ICT policies (Murgor, 2015). A lack of national ICT policies leads to the situation where each academic institution has to do what it knows best without any central coordinating protocol. The importance of a national ICT policy cannot be overemphasised because it would go a long way towards streamlining ICT implementation across academic institutions, both private

and public. Thus, the literature reveals that most African countries lag behind the world in terms of ICT infrastructure and human capital development.

The Covid-19 pandemic caused a crisis that disrupted the traditional learning approaches in universities. However, in their study in South Africa, Sayed et al. (2021) showed that from crises, synthesis and potential for fundamental social change can also emerge. Crisis compels a search for alternatives in response to an unstable equilibrium, resulting in opportunities to adopt digital technologies in developing countries like Zimbabwe. "Crises then, as in the case of the Corona crisis, interlock both with existing frailties and coalitions and intersect with existing challenges against colonialism, subjugation, and marginalisation" (Sayed et al., 2021, p. 12). We argue that the Covid-19 pandemic has created an opportunity for a migration to e-learning platforms that can be complemented with blended learning approaches but which, however, continues to be affected by the digital divide. This coronavirus crisis not only promotes the notion of change but it is also reflective of the deep-seated and unequal relations in society (McCann & Matenga, 2020).

Having looked at ICT challenges at the national level, we now explore institutional challenges with regards to viable and responsive ICT infrastructure and ICT-competent human capital. Digital possibilities must be combined with the quality of professionals to reveal their power of transformation; thus, digital transformation needs both technology and people (Martin et al., 2021). Many universities in developing countries are grossly underfunded and consequently not able to sustain the infrastructure required for securing viable ICT facilities. A study carried out in Indonesia by Owen et al. (2020) revealed that universities in developing countries have problems with the acquisition of ICT facilities such as computers and implementing viable networking infrastructure. Owen et al. (2020) further underscored that most universities in developing countries do not have the learning management systems, which in developed nations, have become virtual classrooms. Lack of such critical ICT infrastructure becomes a major deterrent in implementing an online curriculum. Murgor (2015) elaborated that other challenges relate to staff retention, inappropriate ICT infrastructure, and computer illiteracy amongst staff and students. Lack of computers becomes a real concern when students are required to navigate a learning management system, set up email and Twitter accounts, and know how to scan the internet. Under such circumstances, e-learning has become problematic in most universities in African countries. Developing and retaining ICT human resources also remain a major challenge in African universities because of low salaries and poor conditions of service (Murgor, 2015).

Although the Covid-19 pandemic has affected university education globally, universities in developing nations have been caught unprepared because of inappropriate ICT infrastructure and lack of adequate ICT human resources. Our study thus explored the emerging challenges and prospects of e-learning in the wake of the Covid-19 crisis in Zimbabwe. The study aimed to examine the extent to which Zimbabwean universities are prepared to adopt e-learning approaches in the wake of the Covid-19 pandemic. This was done by interrogating the staff's perceptions on the state of ICT infrastructure in Zimbabwean universities. Issues of concern also included the competence of the human resource with regards to ICT and the extent to

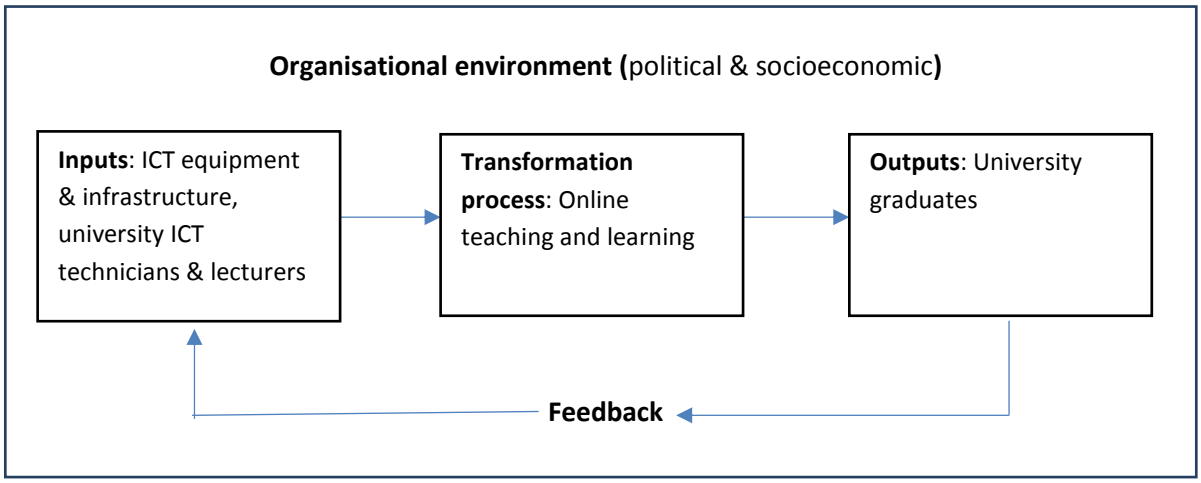
which students can use ICT independently. Furthermore, the study assessed the gender stereotypes in ICT and their effect on the learning of the female student during a lockdown.

Theoretical underpinnings

The efficacy of e-learning in the institutions of higher education is adequately illuminated through the lenses of open systems theory. In this regard, institutions of higher education are viewed as an open system that interacts with the environment (Norlin, 2009). A system is an interrelated set of elements functioning as an operating unit (Senge, 2006). The interrelated elements include inputs, a transformation process, outputs, feedback, and the environment (Figure 1).

Figure 1

Open systems theory (Senge, 2006)



Based on Norlin (2009), inputs to a system such as a university include human, financial, physical, and information resources. For our study, the interest was on people who possess ICT skills, students, and the ICT infrastructures that are relevant to e-learning pedagogies (inputs). ICT infrastructure and equipment and ICT skills tend to compromise the effective implementation of virtual pedagogies in universities. The transformation process includes virtual classrooms where ICT is used to deliver the curriculum through techno-based pedagogy. Outputs comprise graduates from universities who would have gone through the transformative process. The transformation process is effected with consideration of the external environment to produce competent graduates as outputs. In this process, feedback is crucial in informing the formation of a national ICT policy.

Open systems theory presupposes that institutions such as universities operate in an environment that mediates the management and pedagogical processes therein. World over, universities have been exposed to an environment disrupted by the Covid-19 pandemic. The advent of the pandemic created a new learning environment that demanded universities migrate to virtual learning. By extension, universities do not operate in a vacuum, but within given socioeconomic and sociopolitical environments that define management and

pedagogical processes. However, for Zimbabwe, the operating environment for universities was further exacerbated by the economic crises prevailing in the country (Maunganidze et al., 2021). According to the African Development Bank (2021), before the Covid-19 pandemic, Zimbabwe's economy was already in recession, contracting by 6.0% in 2019. The same report revealed that the onset of the pandemic and continuing drought led to a 10% contraction in real GDP in 2020 and inflation soared, averaging 622.8% in 2020 (African Development Bank, 2021). Under these conditions, institutions of higher education in Zimbabwe may not be able to fund the procurement of the required ICT equipment and infrastructure. More so, the economic crisis has resulted in skilled people (experienced lecturers and ICT technicians) moving to other countries. In this socioeconomic environment, issues of governance in institutions of higher education have become compromised, thereby affecting the implementation of the national ICT policy. Furthermore, the politically unstable environment affects planning and responsiveness of institutions of higher education institutions to crisis emergences like the Covid-19 pandemic. Thus the unresponsive ICT infrastructure (including the learning management systems) together with some ICT-incompetent human capital has tended to derail the transformative process—hence, virtual learning remains a challenge. Thus when analysing the Covid-19 and virtual classroom conundrum in Zimbabwean universities, we were cognisant of the environmental factors and the digital divide that shape the pedagogical processes in universities. The open systems theory thus illuminates the preparedness of (or lack thereof) the ICT infrastructure and human resources in Zimbabwean universities to adopt an online learning model in the wake of the Covid-19 crisis.

Research methodology

Our study adopted an exploratory research design to guide the process of collecting, presenting, and analysing data. Five universities (three public, and two private) were purposively selected because they were the only universities in the conveniently selected province where the study was conducted, and they have a fair representation of students from both urban and rural areas. The qualitative study allowed an in-depth exploration of the experiences, attitudes, feelings, and perceptions of the research participants (Neuman, 2014) regarding the preparedness of universities in Zimbabwe to offer online programmes and techno-based pedagogy in the wake of the Covid-19 crisis. The sample (see Table 1) comprised five deans and five lecturers (representing the faculties of sciences, education, medicine, commerce, and law) who were purposively chosen due to their experiences with online lectures. Simple random sampling was used to select 40 students of whom 20 were male and 20 female from the aforementioned faculties. In other words, one faculty per institution with its dean, a lecturer, and students were selected. Students were recruited through different module WhatsApp groups provided by the lecturers. The different faculties revealed peculiar experiences with online teaching and learning. Based on Patton (2007), purposive sampling allows researchers to identify information-rich sites. The 40 students participated in five focus group discussions (FGDs) with eight members each, and groups were balanced in terms of gender.

Table 1

Participants of the study

University (public or private)	Faculty selected	No. of staff	No. of students
Public University 1	Faculty of commerce	1 dean, 1 lecturer	8
Public University 2	Faculty of sciences	1 dean, 1 lecturer	8
Public University 3	Faculty of medicine	1 dean, 1 lecturer	8
Private University 1	Faculty education	1 dean, 1 lecturer	8
Private University 2	Faculty of law	1 dean, 1 lecturer	8

The key informants—comprising the five deans, five lecturers and five disadvantaged students (one per institution, and who were part of the eight students selected per institution)—shared their experiences with regards to ICT infrastructure and ICT human resources in light of the closure of universities as a result of the Covid-19 pandemic. In-depth interviews helped to elicit constructs and narratives on university preparedness to offer programmes online in the wake of the Covid-19 crisis. Other factors explored through in-depth interviews included disability, gender, and location of students to the ICT infrastructure and accessibility of the internet. We adopted a thematic analysis approach in which we analysed the data set collected through the FGDs and in-depth interviews and then coded the data, which addressed specific research questions. To this end, Braun and Clarke (2006) have explained that a theme captures something important about the data in relation to the research question. The themes reported in this study are predetermined because they were guided by specific research questions. Open systems theory was thus used to illuminate the challenges for and prospects of the ICT infrastructure and human resources in moving learning to online platforms. To observe research ethics, permission to conduct research was sought from the university authorities. Participation was entirely voluntary and we sought informed consent from the research participants who completed consent forms. To protect the anonymity of the participants the collected data were aggregated and generalised.

Findings

Findings of our study reveal that because universities were compelled to abruptly close down as a measure to observe social distancing during the Covid-19 pandemic, the only tenable alternative to continue education was to move much of the learning to online platforms. However, the universities in this study were caught flat-footed and unprepared to migrate to e-learning platforms for curriculum delivery and techno-based pedagogy. Major problems that emerged related to the lack of a learning management system, inadequate ICT

infrastructure and ICT human resources, lecturers and students with challenges using ICT, the high cost of internet bandwidth and data bundles, as well as inaccessible internet and telecommunication services in some parts of the country, particularly in rural areas. Against this backdrop, provision of education during the period of lockdown through ICT became discriminatory given that some students with disabilities, and others in poverty struggled to access e-learning materials.

The state of ICT infrastructure in five universities

In-depth interviews with deans of faculties in the different universities revealed that ICT infrastructure was still a long way from allowing the offering of education programmes based entirely on e-learning platforms. It emerged that the two institutions that do have a reasonable ICT infrastructure are offering blended learning. Blended learning is a combination of face-to-face and online learning via the Blackboard learning system (Hakami, 2017). The other three universities largely remained stuck in traditional face-to-face classrooms (the approach before the outbreak of the Covid-19 pandemic) which, however, was not possible under the circumstances of the Covid-19 pandemic. An interview with one dean of a faculty at a private university revealed:

> At the moment, we don't have a learning management system per se, but our institution provides a strong bandwidth so that students on campus can surf the internet. All our lectures are offered in physical classrooms [when given the reprieve to open] although of late we have introduced some projectors for PowerPoint presentations. The university recently procured an anti-plagiarism software, so our students are now required to submit soft copies of their assignments through emails such that they are marked online.

Another dean at a public university shared her experience with ICT at her institution:

> Yes, we have a learning management system, but I think many applications have to be installed such that the Blackboard learning system becomes operational. What is possible for now is that students can open their e-learning portals where they can receive and submit their assignments. Lecturers can, as well, submit different learning materials on students' portals. I can say what we have is a blended learning approach.

A lecturer at a private university had this to say:

> As a university, we are far away from being able to offer our curriculum entirely online. Our ICT infrastructure needs a lot of reworking and this process costs a lot of money. What we have been doing is to use ICT in presenting lectures and then receiving assignments from students and mark them online. In other words, we don't have a learning management system as yet.

Discussions with FGD 1 from Public University 1 and FGD 4 from Private University 1, as well as with FGD 3 from Public University 3, confirmed that these universities had no functional learning management systems. The ICT infrastructure in these universities is

meant to support physical face-to-face class sessions and not distance learning. FGD 5 from Private University 2 highlighted that other challenges with ICT infrastructure include the high cost of acquiring, installing, operating, maintaining, and replacing obsolete hardware and software. Students said that the ICT infrastructure was incompatible with the needs of students living with a disability. For instance, the blind students and hard-of-hearing students were not considered in the current online teaching and learning system. However, only one private university has computers that are compatible with the needs of their visually impaired students. Generally, virtual learning experiences from both public and private universities were similar, although private institutions' response rate to the demands of the emergent crisis was faster because there is less bureaucracy and red tape. This may explain why they have ICT facilities that cater for the blind students.

Another challenge mentioned by participants was the high cost of bandwidth and licensed software. An interview with a lecturer revealed:

> Because of the high costs that go with licensed software, we have resorted to the use of unlicensed software. However, such software can be problematic legally and have high costs of maintenance. More challenges come about when the pirated software is not in standard formats. Another challenge has to do with the computers that we bought long back; they are outdated and almost obsolete, but the university cannot replace them.

A faculty dean at one university elaborated:

> I have already said that as a university, we do not have a learning management system. This means offering our programmes online in the wake of the Covid-19 pandemic becomes a serious challenge. We may resort to emails and WhatsApp group discussions, but I think you agree with me that such platforms are not as immersive as virtual classrooms.

In summary, three universities (one private, and two public) had no functioning learning management systems and appropriate ICT infrastructure. For these institutions, lectures were conducted through WhatsApp. The other two institutions conducted some classes on the Google Meet platform and also sent some work to students via email. There were peculiar challenges linked to specific faculties. The faculties of sciences and medicine had serious challenges with online lectures. One dean at a public institution shared his experiences:

> Although we have a learning management system at our institutions, conducting laboratory work and other practicals was not possible. Lecturers simply sent notes to students explaining certain experiments.

Similarly, a dean in a faculty of education revealed:

> We could not place student teachers for teaching practice because schools were closed. We had to wait until such a time when schools were allowed to open.

Students from the faculties of law and commerce could also not place their students for work-related learning. On the whole, practical lectures were a quite a challenge as was revealed by many of the universities we studied.

ICT competencies of staff and students

From an open systems theory perspective, the ICT competencies of staff and students constitute part of the critical inputs that have a strong bearing on the teaching and learning process through different online platforms. Four of the five lecturers said that they struggle to deliver lecturers lectures on e-learning platforms because they lack the requisite ICT skills. An interview with one lecturer at private university revealed:

> Most of us have challenges using ICT devices and the learning management system. Some lecturers cannot set and prepare a Skype discussion with students. It is even worse when it comes to grading, rating, and assessing students' work using the learning management system. In the worst scenario, we have lecturers who cannot mark assignments online. The Covid-19 outbreak caught us unawares; otherwise, when we talk of going online, there is a serious need for induction and training workshops, which again may not be possible because of the lockdown restrictions.

A dean of faculty concurred and added:

> To be honest, the majority of lecturers lack the requisite skills in ICT. Even for simple connections to run projectors for PowerPoint presentations, they seek assistance from ICT technicians or some techno-savvy students. Some of them struggle with e-learning portals where they are expected to upload students' learning materials, receive, and mark students' assignments online. What it means is that migrating to entirely e-learning approaches gives us some challenges. Right now, we are in a dilemma because with the outbreak of the Covid-19 pandemic we are forced to go virtual.

Another dean shared his sentiments during an interview:

> The outbreak of Covid-19 and the subsequent closure of universities caught us off-guard. The only way to continue offering education under the circumstances of this pandemic is to move much of the learning to online platforms. Unfortunately, most lecturers are incompetent when it comes to ICT applications. Furthermore, we have a limited number of ICT technicians in the university. There is a need to capacity-build our lecturers so that they can use ICT competently. Under these circumstances, we will have to make do with emails and WhatsApp group discussions, which may not be reliable because of other factors.

An interview with one lecturer revealed that ICT incompetence acquired a gender dimension because more female lecturers than their male counterparts were perceived to have greater challenges. She said:

> You may want to know that more female lecturers tend to have more challenges with ICT applications as compared to their male counterparts. Some of them are reluctant to attempt to learn, they always seek the assistants of ICT technicians or other male lecturers. I have seen many female lecturers who fail to operate a projector or an interactive learning board. As a woman myself, I understand them better. It is the way we are brought up through gender role socialisation. Sciences and ICTs have always been stereotyped as masculine hence, female students never put effort to understand it. Under the circumstances of the Covid-19 pandemic and the subsequent lockdown, female lecturers are found lacking and this may compromise effective delivery of online programmes.

Discussions with FGD 5 from Private University 2 revealed that, although the majority of students could use ICT applications with no challenges, a significant number still had challenges using the learning management system. There were students who, because of poverty or a rural background, struggled to operate ICT devices. When universities were compelled to abruptly close down, they had barely been open for two weeks. Therefore, new students had not been inducted on how to use the learning management system and other ICT devices that facilitate learning in the respective institutions. Thus, the ICT incompetence of some students made it difficult to have viable online teaching and learning sessions. The discussions also confirmed that some of the lecturers struggled with ICT applications. And it emerged that lack of computer skills in students took on a gender dimension. A participant in FGD 4 from Private University 1 revealed that more female students than their male counterparts struggled with ICT applications because often, female students seek the assistance of male students. It was revealed that most female students and female lecturers tended to lack technical skills in ICT because of gender stereotypes.

Disadvantaged university students and ICT

Our study revealed that certain groups of students were more affected than others were by the closure of universities due to the Covid-19 pandemic. While e-learning is supposed to offer prospects for more access to education for these students, it has become a means for intensifying social exclusion. To this end, the coronavirus crisis tends to interlock with existing frailties and coalitions, and intersect with existing challenges of marginalisation (Sayed et al., 2021). Such students include those with disabilities, the poor, and some female students. Female students experienced disadvantages because of lack of exposure to ICT while growing up due to gender stereotypes attached to science and ICT. A technical report of a study on gender and STEM (science, technology, engineering, and mathematics) subjects in Zimbabwe by Chingarande et al. (2021) revealed that the female university students struggled with ICT.

Students who have disabilities were also disadvantaged. A telephone interview with a student who is visually impaired revealed:

> In my studies, I rely very much on audios of recorded lectures. However, by the time we closed they were no recorded lectures for us. Moreover, we don't have computer

> devices that have braille so that we can do our assignments from here. So, for some of us, learning has stopped during this period of the Covid-19 pandemic.

Students living in very remote rural areas also experienced disadvantage. A student who lives in one of the remote rural parts of Zimbabwe shared his experience:

> I have to walk for about 25km to get to the growth point to access the internet. At times, I get there only to find there is no electricity. The major challenge is to acquire data bundles to download materials to respond to assignments sent by lecturers through emails.

Similarly, deliberations with FGD 3 from Public University 3 revealed that there were students who did not have an electronic device, not even a simple cell phone. Most of such students live in remote rural areas where access to the internet and telecommunication services is very poor. In some remote rural areas, one has to travel long distances to get to a point where the internet is accessible and even at such points, the internet transmission remains weak. During periods such as the lockdown as a result of Covid-19, such students became completely shut out from communication. These sentiments were echoed by FGD 2 who elaborated that students who live in poverty may own a phone but cannot afford data bundles. In the same discussions, it was revealed that most female students struggled with operating ICT devices. Girls in the discussion groups admitted that, quite often, they sought assistance from their male counterparts.

Discussion

The unavailability of responsive and compatible ICT infrastructure remains a major challenge for the five studied universities in Zimbabwe. ICT infrastructure constitutes critical inputs in the form of ICT equipment, learning management systems, as well as lecturers with ICT skills that necessitate the transformation process, that is, learning through online techno-based pedagogies. Irresponsive and incompatible ICT infrastructure in local universities compromises e-learning through virtual classrooms in the wake of the Covid-19 crisis. The findings of this study thus confirmed observations by Owen et al. (2020) that most universities in developing countries have no learning management systems.

In their study in South Africa, Fataar & Norodien-Fataar (2021) observed that digital technology has been a ubiquitous, albeit uneven, feature of educational platforms for at least 40 years, growing exponentially over the last 20. However, in Zimbabwe, technical development has been stalled by the economic crisis (Maunganidze et al., 2021) and the digital divide between developed and developing nations has become more conspicuous in the wake of the Covid-19 pandemic given that most universities in African countries have struggled to provide comprehensive online education packages during this period. Although e-learning offers prospects for social inclusion, in the Zimbabwean case, it further intensified social exclusion.

Owen et al. (2020) further observed that in developed nations, learning management systems have transformed traditional classrooms into virtual classrooms in which Skype is used as a tool for video conferencing and conference calls with students at a distance. By extension, universities in developed nations have adapted more easily, going virtual during this period of Covid-19 crisis. Under the pandemic, existing socio-technical discrepancies were often magnified and diverse forms of exclusion, marginalisation, and vulnerabilities emerged (Zheng & Walsham, 2021).

Although two of the studied institutions had established a learning management system, participants noted that the system was not fully operational because it lacked the critical applications that facilitate virtual classrooms. Critical applications for learning management systems include centralised learning materials incorporating videos, slide decks, assessment tools, and smart scheduling tools amongst others. The learning management systems need to be upgraded so that simulations and experiments can be demonstrated through online lectures. The high cost of bandwidth was also found to be a deterrent to online curriculum delivery. In this regard, a study by Ruhinda (2013) in Kenya underscored that there is a need to provide lower bandwidth-demanding applications for virtual classrooms, which are suitable to the general user with less internet bandwidth. Thus, in developing nations like Zimbabwe, the high cost of broadband internet access becomes a major deterrent to deliver online programmes. The situation in African universities is further exacerbated by the fact that the African continent lacks a continent-wide broadband optical fibre network (Murgor, 2015). A continent-wide broadband optical fibre network would improve internet accessibility at reasonable costs for universities in Africa. Thus, the incompatible and irresponsive ICT infrastructure, high cost of bandwidth, as well as inadequate and unreliable telecommunication services create a challenge for many universities in Zimbabwe to offer their programmes entirely on e-learning platforms in the wake of the Covid-19 crisis.

Another serious challenge with ICT infrastructure has to do with its incompatibility with the needs of students with a disability. Our study revealed that four of the five studied universities in Zimbabwe have ICT devices that cannot be used by students who are visually impaired or hard of hearing. To this end, Zheng and Walsham (2021) observed that the Covid-19 pandemic has unveiled and thrown a spotlight on deep-seated inequalities. We argue that due to the Covid-19 pandemic, students with disabilities have become further discriminated against because they lack ICT devices that are user friendly for them.

It is also clear that the lack of ICT skills by both lecturers and students was a major hindrance to the full implementation of online models of teaching and learning in the circumstances of Covid-19. In this regard, a study by Chisango and Marongwe (2021) found that the inadequacy of ICT and familiarity with ICT modes of teaching and learning in South African schools created “digital, information and knowledge divides” (p. 161). The Zimbabwe scenario confirms the South African situation given that students in urban areas have more access than those in rural and remote areas. When looked at from an open systems theory perspective, ICT human resources and students constitute part of the critical inputs that could drive the transformative process (e-learning through virtual classes) during periods like the

Covid-19 crisis where social distancing became a real issue. A study by Owen et al. (2020) in developing nations revealed that another barrier to e-learning is the universities themselves, which lack experience and understanding of online learning. A similar study by Hakami (2017) in Saudi Arabia revealed that successful use of e-learning models was compromised by the lecturers' lack of knowledge of the features offered by Blackboard, the learning management system used to support the teaching and learning process. Martin et al. (2021) concurred and elaborated that ICT skills not only help to provide in-depth knowledge of basic courses but also increase the flexibility of delivery of education such that that students can access knowledge anytime and from anywhere.

It remains indisputable that ICT skills have become one of the critical resources to institute a viable alternative teaching and learning platform in the wake of the Covid-19 crisis. However, for the studied five Zimbabwean universities, the digital divide between developed and developing nations was evidenced by the lack of ICT skills in both lecturers and students. Zheng and Walsham's (2021) study confirmed that under the pandemic, existing socio-technical discrepancies are often magnified and diverse forms of exclusion, marginalisation, and vulnerabilities emerge. In the same vein, Owen et al. (2020) underscored that lack of computer skills by the students is a major deterrent to online learning given that they are required to navigate the learning management system, set up email and Twitter accounts, and know to scan the internet. In Zimbabwean universities, first-year students who had been barely two weeks in university when they closed were the hardest hit by the sudden closure due to the Covid-19 pandemic because they did not have any opportunity for induction and training in ICT skills. Murgor (2015) further observed that developing and retaining ICT human resource remains a major challenge, particularly in African universities, because salaries are too low and the working conditions are not sustainable. It can thus be concluded that the combination of a lack of compatible ICT infrastructure and ICT-incompetent lecturers and students is a recipe for disaster with regards to virtual learning—particularly during the Covid-19 pandemic where observation of social distancing becomes a critical practice to avoid the spread of the virus.

The failure of ICT infrastructure and human resources to adapt teaching and learning models to e-learning modes has resulted in a grossly disproportionate access to education among university students. The digital divide between disadvantaged students and students in urban areas further intensified social exclusion during the period of the lockdown as a result of the pandemic. Our findings confirm those of the study by Sayed et al. (2021) that Covid-19 has amplified the digital divide and preexisting inequalities in institutions of higher education, particularly in developing nations like Zimbabwe. We argue that e-learning models in the wake of Covid-19 further marginalise groups already excluded or marginalised from existing educational practices and the environments. And yet, a study by Murgor (2015) revealed that in developing nations, the use of ICT can create improved prospects and opportunities for facilitating a greater inclusion of the marginalised groups into online learning platforms. Although ICT can be very empowering, providing opportunities for education otherwise inaccessible to the disabled, it can also create new barriers that exclude them even more

(UNESCO, 2006). The digital divide in the era of Covid-19, which emphasises social distancing, will further intensify social exclusion.

Conclusions

Although virtual learning has become the most tenable method of providing education in the wake of the Covid-19 crisis, most universities in Zimbabwe are not yet prepared to migrate entirely to e-learning models of learning. The main challenges relate to poor ICT infrastructure and ICT-incompetent lecturers and students. The cost of bandwidth and data bundles was found to be another deterrent to online curriculum delivery. Students living with disabilities, and others in poverty were found to struggle to access e-learning materials during the period of lockdown due to the Covid-19 pandemic. Furthermore, gender stereotypes were seen to affect female students' competencies in ICT because ICT, just like any other science, has been stereotyped as a masculine field. Our study observed that the digital divide between disadvantaged students and well-positioned students intensifies social exclusion of the former in the circumstances of the Covid-19 pandemic. In the circumstances of ICT infrastructure in local universities, e-learning intensifies the social exclusion of students in difficult circumstances. Zimbabwean universities are still a long way from being able to adapt entirely to e-learning models and, as a consequence of Covid-19, access to education remains an illusion for many prospective students.

Recommendations

Based on the findings of this study, we recommend the following:

- There is a need for universities to consider substantial investment in ICT infrastructure because the global trend shows that learning has gone virtual.
- Local universities also need robust training workshops to capacity build lecturers in using the learning management systems and other e-learning facilities.
- ICT induction for all first-year students should be made compulsory.
- The government, through the relevant ministry, should be encouraged to subsidise the cost of bandwidth in universities.
- A national ICT policy should be put in place to regularise and standardise the implementation of e-learning in public and private universities.

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