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Computer-Based Training and Leaning under the Influence of the COVID-19 Pandemic: A Case of South African Institutions of Higher Learning

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ABSTRACT

The article investigates computer-based-training during the COVID-19 pandemic in South Africa's Institutions of Higher Learning, as well as assess the feasibility of Computer Based Learning in the post-COVID era. The data was gathered through the use of desk-top research by looking at how various South African university institutions have made CBT an important learning and teaching tool when it comes to copying with the politics that came about with lockdowns such as the closure of schools as a way to manage the spread of the pandemic. The study reveals that, the emergent appearance of the COVID-19 pandemic in South Africa, saw an increased usage of computers and mobile phones as an alternative learning tool which could eventually replace face to face learning. It is however revealed that, the success of computer based training and learning heavily relies on efficiency and reliability of computer infrastructure, reliable internet connectivity as well as knowledge of computer technology by instructors and learners. The research is however, limited to the confines and experiences of South African educators and learners and concludes by giving recommendations on how these challenges can be solved.

KEYWORDS: *Computer-based training, Information Communication Technologies, Institutions of Higher Learning, Virtual learning, South African Education, COVID-19*

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INTRODUCTION:

Faced with the current COVID-19 pandemic, both learners and staff have been forced to shift from face to face learning to on-line learning through the use of Computer Based Technologies (CBT). Computer-based training has been defined as self-paced distance training and learning activities that rely on using computers (Schwaninger,2011).Lin et al., (2017), stresses that the application of digital technologies and computer based learning is alternatively referred to as e-learning. Sánchez, C., & Alemán, C. (2011) further define Information Communication Technology (ICT) as the use of computers, the electronic delivery system such as televisions, radios and projectors as well as the internet. ICT is therefore the use of the internet and computer technology to convey information. In this case, CBT and ICT shall be used interchangeably.

The COVID-19 pandemic and difficulties it brought which did not allow students to go for face to face lessons, did brought a lot of innovation in the CBT or ICT industry as students and teachers were expected to quickly adopt to the new way of learning using online technologies. The rapid developments in information and communication technologies (ICT) have played a major role in the lives of students and trainers or teachers alike. ICTs have transformed the traditional teacher-centered classroom to a learner-centered paradigm, offering an interactive and collaborative resource-rich environment that fosters participation and information sharing (Hunde et al., 2010; Montrieux et al., 2015; Zhu et al., 2020). Papadakis et al., (2018) reported that mobile phones provide a new and innovative way to rejuvenate the teaching and learning processes around the world. This in turn offers learners the platform to actively participate and also flexibility when it comes to location and time constraints.

Apart from computers, mobile devises have also proved to be useful tools when it comes to making the lives of learners easier. Papadakis et al., (2018)acknowledged that mobile devices provided features such as real-time access to information, communication, context awareness, and feedback that could support self-directed learning. In developed countries, learners access rich digital tools at home to learn to create content, solve problems, engage, collaborate, and network, thereby laying a foundation for 21st-century skills acquisition (Papadakis et al., 2018; Rambe & Bere, 2013). The integration of ICTs in education has therefore increased student satisfaction and engagement. (Wahab & Ali, 2020) notes that the education system must rapidly embrace emerging technologies to support remote learning. This means, internet access must not be limited by geographical boundaries, which in turn presents equal learning opportunities for every student.

Online learning may soon become as alternative to face to face learning as depicted by increased numbers of online enrolments, globally (Studies, 2020). This has further been re-emphasised by the outbreak of pandemics and natural disasters which have clearly shown that teaching and learning are not only confined to the four walls but have revealed the interconnectedness that exists between education and technology (Wargo et al., 2021). However, significant challenges have accompanied this huge educational shift from face to face to online learning during the pandemic. These challenges include poor ICT infrastructure in institutions, lack of internet and skill when it comes to the use of ICT in teachers, as well as and poor student reach ability or accessibility (Khalil et al., 2020; Ferri et al., 2020). Faced with the current pandemic, the global education system must therefore adapt to the new norm, by moving away from the conventional face-to-face to virtual and online learning especially in the wake of unforeseen health disasters such as the Coronavirus disease of 2019 (COVID-19) pandemic. The study now gives a brief background to the study, which relates to the use of ICT during the COVID-19 pandemic and possibility of use in the post-COVID-19 era.

Background and Overview

The COVID-19 disease was discovered in Wuhan, China in December 2019(Sharma & Alvi, 2021; Zhu et al., 2020). The disease has since spread to other continents, and as at 20 August 2021, 209 876 613 COVID-19 cases have been confirmed globally and there has been 4 400 284 confirmed deaths and 4 562 256 778 vaccine doses administered world-wide (WHO, 2021a). Whilst it has been argued that vaccines can prevent injected people from suffering from the severe negative effects of the disease, it has also been revealed that vaccinated people can also suffer from the pandemic and spread it to others (CDC, 2021; WHO, 2021b). This has prompted many governments worldwide to operate in a mode of radical uncertainty through the continued implementation of partial and total lockdowns in order to manage the spread of the disease (Ntshwarang et al., 2021). These national lockdowns have in turn affected people's way of life, particularly those of students in institutions of higher learning as they have been forced to stay at home and adapt to the new norm of learning by making use of virtual or online learning through the internet (Wahab & Ali, 2020; Kapasia et al., 2020). This has seen many countries at international and regional levels adopting online virtual learning at both the international and regional levels (Zalat et al., 2021). South Africa has been no exception as it has also seen the increased adoption of online learning in its secondary and tertiary education institutions (Dzinamarira et al., 2021). The article mainly concentrates on institutions of Higher Learning in South Africa, which in turn leaves a research gap as it does not give an in-depth analysis of other countries within Southern Africa and beyond. The article does not look at other educational sectors as well as such Primary and Secondary education, which also leaves a gap to be further explored when it comes to COVID-19 issues in relation to online learning in these other sectors. The article now looks at the theoretical framework guiding the discourse.

Theoretical Underpinnings

The study is motivated by the Technology Acceptance Model (TAM) put forward by Davis in 1989 (Davis 1989). This was chosen as a result of its significant link to the study. The TAM is an information systems theory that models how people or users come to accept and use technology (Urhiewhu et al., 2015). The model suggests that, whenever users are presented with new technology, there are a number of factors that influence how and when they will decide to use it and these mainly relate to behavioral intentions which include perceived usefulness and ease of usefulness of the system, attitude, individual intention or organizational position (Santi et al., 2020.; Urhiewhu et al., 2015). In this case, for Computer Based Training (CBT) to be fully accepted as a permanent and more convenient way of learning during the COVID-19 era and beyond, the teacher and the learner must be fully acquainted as regards to how to effectively use CBT and in turn develop a positive attitude towards it. Davis, (1989) further emphasizes that, acceptability or the ability of people to reject information

technology is based on attitude of the user towards the system (Davis 1989). Two elements (figure 1) have been regarded as important in making people accept or reject ICT, and these are Perceived Usefulness (PU) and Perceived Ease of Use (PEU).

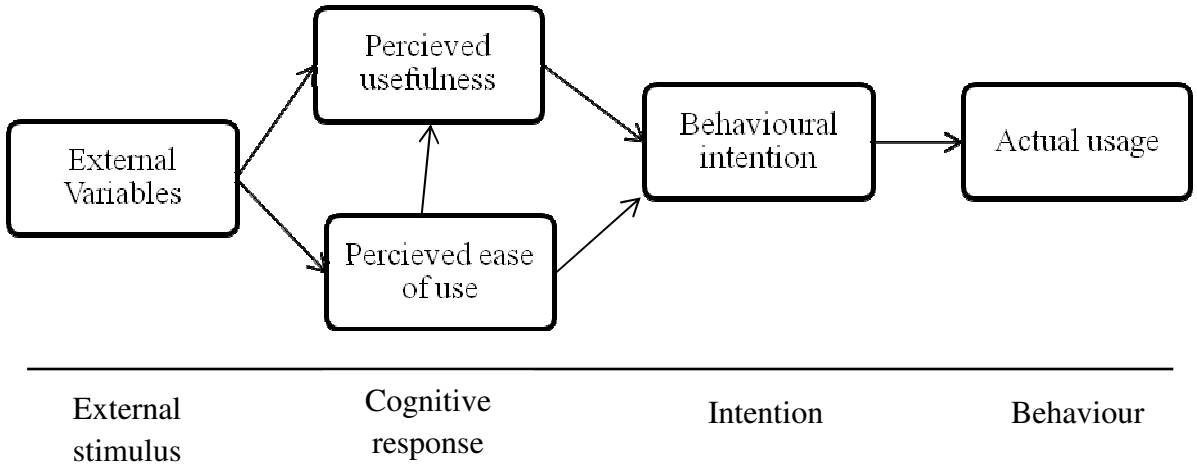

Figure 1: Technology Acceptance Model (Davis et al., 1996)

The diagram shows that, the external valuables found in potential users which are PU and PEU are quite essential in determining behaviour and the attitude of people towards actual usage of ICT devises. These external variables shall now be explained and how they link to the positive use of technology.

External Variables / External Stimulus

External Variables are factors that come from outside and not from within, whilst stimulus is an instant reaction that people do when they see a new product, or when they have been told to instantly adapt to the new way of living without choosing (Cambridge English Dictionary, 2021). In this case, the way people would react to new normal of quickly shifting to online learning from the previous face-to-face learning (with either a positive attitude or a negative one) would be regarded as an external stimulus. How people would perceive the new normal would have an impact of the success of the immediate shift from face to face learning to online learning.

Cognitive Response - Perceived Use and Perceived Ease of Use Explained

Cognitive Response is defined as the change in attitude through persuasive communication and this may ignite with a person's existing attitude (Greenwald, 1968).PU is defined as the extent to which a person believes that his or her job performance will be enhanced by using a particular system (Davis, 1989). In this regard, if both students and staff believe that the use of CBT or ICT in learning will improve their performance in their job (for staff) and in their learning (for students), e-learning platforms are bound to be more successful.

PEU is the ability of students to believe that the use of digital information resources makes learning easier (Davis 1989). In This case, if students believe that the use of ICT in learning is meant to make learning easier, they will develop a positive attitude towards e-learning and this becomes a positive step in the development of e-learning platforms in schools. Perceived Ease of Use is also said to have a direct influence of PU (Davis et al., 1996). If students perceive that new technology is easy to use, then they will believe that they will perform better upon the use of ICT in learning during the COVID-19 pandemic and beyond.

Behavioural Intension and Actual Usage

Behavioural Intension refers to the degree of a person's formulation of plans to either perform of not perform some specified behaviour in future (Urhiewhu et al., 2015). If students and staff all develop a positive behaviour intension towards the use of new technology in learning (in this case, shifting from face to face learning to e-learning), then actual usage of ICT and e-learning platforms will dominate learning institutions. Actual usage in this case would be the rate as which students and staff would adopt to the use of ICT as a medium of learning. These factors (PU, PEU and Behaviour Intension) are interlinked and if the chain is motivated by positive student and staff attitude towards the use of ICT in learning during COVID, then eLearning during the COVID-19 era and beyond is likely to be more successful. The TAM has proved to be an effective tool by practitioners and researchers to predict acceptance of information technologies (Davis et al., 1996). It then becomes a useful tool in predicting the rate of acceptability of new technologies in learning in future.The article now looks at the conceptual framework guiding the discourse.

Conceptual Framework

Defined as a synopsis of various study findings from literature sources that have been reviewed about the research, a conceptual framework sets out the agenda as regards to increase understanding of the research intentions (Shikalepo, 2020). It therefore summarises what the research is all about and what the general findings of the research were in a snapshot. Figure 2is a representation of the conceptual framework relating to the study.

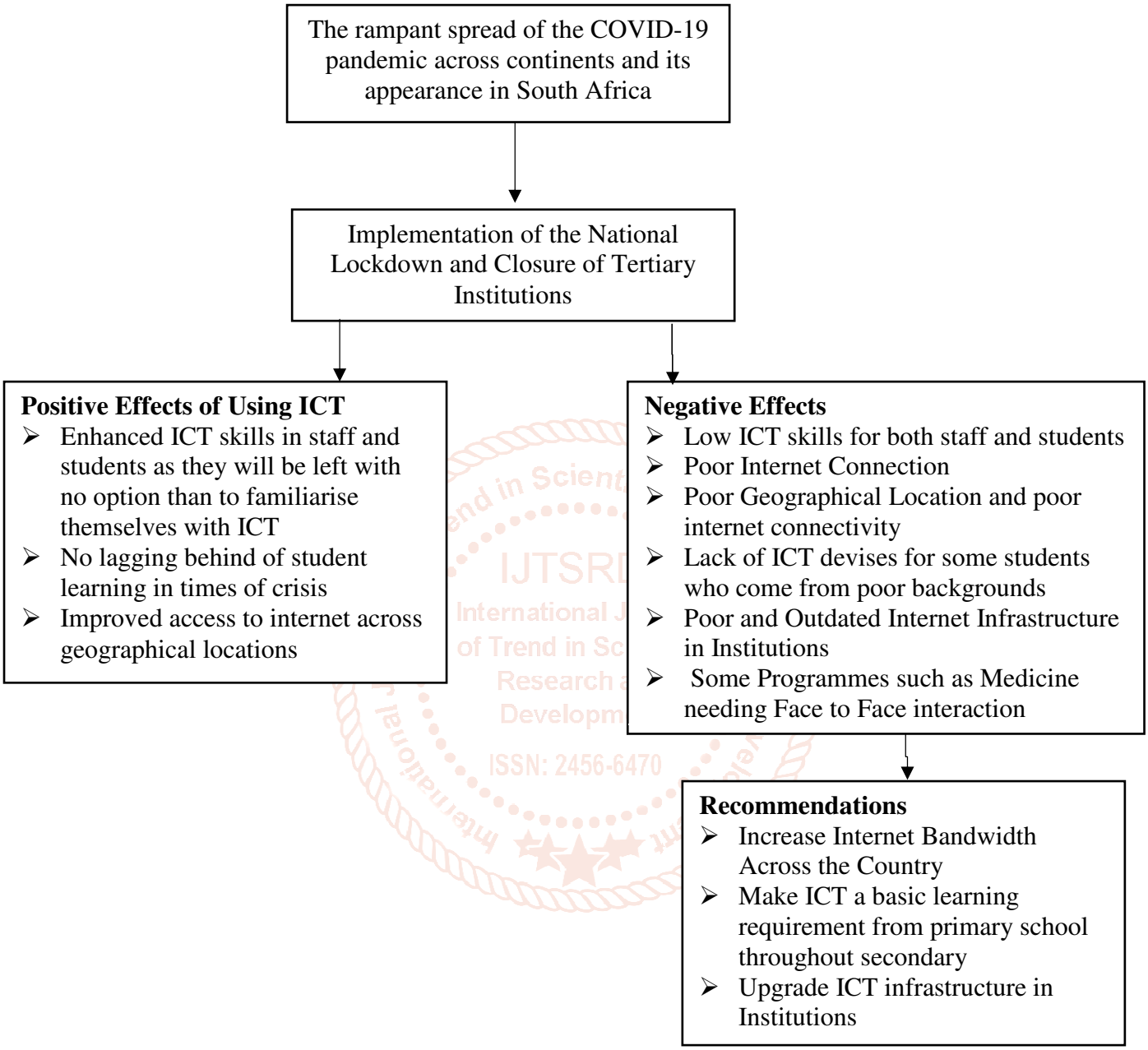

Figure 2: Conceptual Framework (Author, 2021)

It can be noted that, the COVID-19 pandemic incited the closure of schools across the globe by many governments as a way to manage the spread of the pandemic. This has in turn resulted in the closure of schools and the immediate adoption of e-learning or the use of ICT for learning for both learners and trainers or teachers and staff. These have however had own positive and negative effects.

Positive Effects

The positive effects of online learning included enhanced ICT skills in both staff and students. In this regard, both students and staff were left with no option than to learn how to use ICT as a medium of communication and leaning. This in turn developed skill among users during the COVID-19 pandemic period and beyond. Through the use of ICT in learning, students will then be able to keep track with their education and not lag behind with their school work. In efforts to make learning easier for students, government is also bound to increase internet access even in hard-to-reach areas so as to make the majority of students able to access the internet for learning purposes. The shift from face to face to online learning has also came about with some negative effects and these shall now be highlighted.

Negative Effects

The COVID-19 pandemic and the use of ICT or CBT technology also brought about some negative effects along with it and these included poor internet connectivity, poor ICT skills for both staff and students (in some instances), lack of laptops among students as well as poor and outdated ICT infrastructure in some instances. This would mean difficulties for some students and staff to engage in the e-learning exercise and this would mean setbacks and the lagging behind of some students in learning, especially those with no laptops. This would mean, the appearance of the pandemic in the South African Landscape would be handled with such difficulty and hence, the need for the government and other stakeholders such as non-governmental organisations to join hands and improve the life of the ordinary student.

Recommendations

The study in a nutshell therefore recommended government to invest in increased bandwidth to strengthen internet connections no matter where the student may be. This would mean that geographical boundaries would not act as a barrier to cutting network connections for other students especially those that live in remote areas. The study would also recommend that institutions invest and upgrade their ICT infrastructure on-campus so that even during the post-COVID pandemic, students would not struggle to connect to the internet. The ability to make ICT learning a basic learning requirement for students from primary school would guard against the possibility of students and staff not having adequate ICT skills in tertiary institutions. This is because, they would have familiarised themselves with the skill in the early years of their learning. The article now reviews literature related to the study as regards to CBT during the COVID-19 pandemic and beyond. This is done by looking at its adoption at the international and regional levels, as well as the challenges faced. First priority shall however be given to an understanding of what CBT is and the various types that falls under it.

Literature Review

The onset of COVID 19 resulted in a situation where teachers and students are undesirably asked to change their teaching system from the offline face-to-face session in the classroom to the digital/virtual teaching system using various online platforms or applications (Cornelius, 2014). The shift from face to face to online would require various adjustments which has a lot to do with development of skill to use computers and table 1 shows a distinct differentiation between online learning and face to face learning.

Table 1: the differences between online learning and face to face learning

Face to Face Learning	Online Learning
Face to face interaction between student and Tutor or Teacher	Can be synchronous (virtual real time learning) or asynchronous (for example through the use of emails)
Once lesson is over, it cannot be repeated	Online learning videos can be repeated at any time
Students can ask where they do not understand there and then for further clarification and response is direct	In the case of questions raised, response can be delayed
No need for the internet	There is need for the internet to connect, if there is no internet, progress is delayed
Cannot be affected by geographical location	Geographical location can disrupt internet connection
In face to face learning, computer skills may not be necessary	There is need for good computer skills on the part of the learner and the teacher for learning to take place
there might be no need of both parties to own a laptop or a mobile phone with internet	A laptop or computer or a mobile phone is necessary for learning to take place

Source: Cornelius, 2014; Pedagogies et al., 2014; Wahab & Ali, 2020; Kapasia et al., 2020

It can be noted that, face to face and online learning does differ a lot from online learning which requires students and teachers to be well equipped with computer skills and with good internet connection for effective learning to take place. It has in turn become very critical for both teacher and student to quickly learn and adapt their teaching and learning to virtual teaching (Sharma & Alvi, 2021). Teachers are known to spearhead of the implementation of online learning, must therefore be able to condition all instructional components (Montrieux et al., 2015). These include instructional methods, media that will be used in learning, use of instructional time related to the time of application use, and psychological and social factors that significantly affect teachers' motivation when teaching (Rasmitadila et al., 2020)This would ultimately mean the need for more skill in the trainer for lessons to be delivered efficiently and effectively. There are basically two learning approaches and these shall now be discussed at this juncture.

Virtual learning approaches

The study appreciates the two basic delivery modes of online learning and these are asynchronous and synchronous modes. An asynchronous mode of learning refers to the delivery of learning resources and materials via Learning Management System platforms (LMS), such as BB or Moodle. Alternatively, asynchronous online communication does not require real-time participation of both student and instructor, but is supported by tools such as discussion boars, blogs, e-mails and video / audio recordings(Pedagogies et al., 2014). Asynchronous mode of learning therefore allows students to study at their own pace (Reese, 2015).

Synchronous mode involves the real-time delivery of course contents and synchronous software enables both the student and the instructor to communicate orally, as well as exchange messages through various means such as typing, the uploading of power point presentations, as well as the surfing of web pages together (McBrien et al., 2009). Hrastinski, (2008) argues that, synchronous e-learning has the potential to e-learners in the developing learning communities. It offers whiteboard, video and audio streaming as well as the sharing of files (Cornelius, 2014; Pedagogies, 2014). It is also argued that the non-verbal communication signals accompanying the synchronous conferencing sessions make learners feel more connected and engaged with their peers and instructors (Pedagogies, 2014). This helps to overcome the students' feeling of isolation that occurs in an asynchronous environments(Malik et al., 2017).

However, technical problems, such as the internet speed, might stand as a barrier to students' engagement with synchronous platforms (Pedagogies, 2014). However, although it might seem that asynchronous tools are less communicative than synchronous tools, some studies claim that asynchronous tools can improve learners' cognitive skills (Hrastinski, 2008).A combination of synchronous and asynchronous modes in learning then therefore add value to learning for students. It has also been observed that, besides computers, most students and staff are also comfortable with mobile assisted learning due to its easier accessibility.

Mobile Assisted Learning

Studies have observed that, during the home-based learning period, many teachers prefer to use Mobile-Assisted Learning (MAL) which relate to the use of mobile technology asa medium to teach their students. It has been argued that mobile technology has special characteristics in terms of portability (Arashnia et al., 2016; Pratiwi et al., 2020)**,** connectivity and social interaction (Wagner et al., 2016). Mobile phones have also been regarded as user friendly, always in one's pocket and more conveniently accessible than textbooks or computers (Wagner et al., 2016; Mardiah et al., 2020).Various apps can therefore be used in learning activities and these include YouTube to watch videos, Zoom and Google Meeting to have online meeting or video conferencing and Safari to browse Internet (Khalil et al., 2020). This shows the flexibility of the mobile phone to handle many apps for learning and its ability to be a multi-purpose gadget. The study now discusses ICT or CBT in line with COVID-19 at international and regional levels.

Computer-Based Training and Impact of Teaching and Learning at Global Level

National lockdowns and school closures (as ways to manage the spread of the pandemic) would disrupt students learning in most parts of the world and hence, the need for immediate adaptation to online learning platforms. As a way to mitigate the loss of learning in most schools and institutions of higher learning, many countries engaged in remote learning as a way to cope with the crisis (Ntshwarang et al., 2021). Most universities then moved to online learning or E-learning (Wahab & Ali, 2020). Astudy revealed that, many European and East Asian schools in tertiary education swiftly moved to online platforms for teaching and learning(Arnhold, et al.,2020) and these would be either through asynchronous or synchronous modes. Countries (such as Estonia, Denmark, France, Finland and Germany) that had invested in the ICT sector and advanced in terms of digitalization in a strategic way before the crises easily transitioned to online teaching and learning, whilst those that had not established a strategic approach towards digitalization faced more difficulty (Arnhold, et al., 2020).

In the case of Italy however, it was revealed that the North-South dichotomy resulted in students in the North benefiting more than students in the South because in the North advanced learning platforms were being used and more than 51% of students would regularly attend video lessons, whilst those in the Southern region would be given homework to be done and corrected online (Ferri et al., 2020). This is further supported by (Wargo et al., 2021) which revealed that in the year 2019, among 14-17 year olds, two out of three had basic or low digital skills. It was therefore argued that, technological endowment of families was the biggest hindrance impeding or slowing down the definitive affirmation of online learning (Ferri et al., 2020). Various limitations to efficient and effective use of ICT technologies have therefore been noted and these include, lack of equipment and internet at school, improper use of technology and lack of skills to use ICT in teachers(Santi et al., 2020). Wahab

& Ali, (2020) also notes that apart from resources, student accessibility, confidence staff readiness and motivation factors do play an important role in ICT integrated learning. The teacher and the learner must therefore have a positive attitude towards adopting ICT technologies for learning purposes, which in turn coincides with the TAM model which supports students must have a positive attitude towards PU and PEU if new technology is to be successful**.**

Computer-Based Training and Impact of Teaching and Learning at Regional Level

It is quite evident that the COVID-19 pandemic disrupted many socio-economic activities including formal and non-formal education and by mid-April 2020, formal education of at least 1.6 billion students in 192 countries had been disrupted (Mukute et al., 2020). This would mean the need for quick adoption of online learning by schools and universities in order to cope. It was also observed that, those in In a Namibian study carried out in an online survey with 137 undergraduates to understand students learning experiences during lockdowns, it was revealed that mobile devices remained the primary or the basic computing device used to access academic information by students (Kaisara et al., 2021). It was also argued that, mobile learning became the most viable means of learning or most African countries due to ubiquity reasons (Kaisara et al., 2021). In this case, it would be easier for students to connect and learn through their phone, anywhere they may be, as long as there is good internet connection. This then becomes a disadvantage for students located in remote centres where internet is hard to reach (Naidoo et al., 2020).

Unfortunately for most African Universities such as the University of Botswana, eLearning challenges would be accelerated by poor access to internet, excess students, and poor infrastructural developments (Ntshwarang et al., 2021). In another study based on the responses of 56 parents, educators and students involved in non-formal and formal education in Malawi, South Africa, Botswana, Namibia, Zambia and Zimbabwe, main educational challenges identified were mainly concerned to adapting to online learning, continuity of education from home as well as adapting to community based-learning in small groups (Mukute et al., 2020).A study of three universities in Tanzania's Morogoro region, revealed that in all the institutions studies, there was limited applicability of e-learning due to the lack of skill among users, poor attitude, and insufficient ICT infrastructure (Innocent et al., 2020).It was also revealed that unlike students, university faculties also faced difficulties during the COVID-19 pandemic and these include the need for more training on staff to deliver online learning, academic increased workload for staff and staff also faced the risk of being retrenched in order to minimise costs(Agyapong et al., 2020). This shows that both institutions, students and staff all faced difficulties to adopt to the new way of learning during the COVID-19 pandemic.

Sustaining Learning during and after COVID-19 Pandemic

The top priority for some concerned governments during school closures is continuity in learning regardless of means of learning. The seismic shift in this challenging time has brought about a rethinking on how to transform teaching/learning situations into technology-support mode; resuscitate accessible activities; utilise materials and technological devices that are less leading-edge, less sophisticated, and less advanced to students in destitute environments. Some of the learning channels ideal for children's learning irrespective of different categories of teachers and students are employed. In correcting some of these challenges, Mukute et al., (2020) argues that, there is need to reveal structural inequalities and justice issues in education. Innocent et al., (2020)suggests the need for governments to allocate funds in order to make sure that universities become well equipped with ICT facilities and to ensure that students will be well equipped with ICT skills from primary throughout secondary education in order to make sure that students develop a positive attitude towards e-learning. Ntshwarang et al., (2021) suggests the need for both students and instructors to commit themselves to the use of e-learning and also emphasise the need for students and staff to train using online platforms such as Moodle. Kaisara et al., (2021) supports the need for African nations to note that adoption of these technologies is also influenced by cultural, local, political and economic conditions, hence, importing implementation frameworks of foreign countries may make it difficult to yield results. it is also argued that there was need for Higher Learning Institutions to strongly enforce ICT institutional policy, ensure classrooms with ICT infrastructure that is up to date for implementation of e-Learning as well as ensure that there is internet wireless connectivity in the university vicinity (Innocent et al., 2020; Ntshwarang et al., 2021).

Omodan,(2020)notes that there are some learning channels that could be employed by earners from low-income class living in rural/urban areas are face-to-face private lessons, interactive radio instruction, educational television programme, resources for parents, and resources for peer-to-peer learning. Systems, (2020) explain that some learners engage in active and self-regulated learning using alternate resources. Systems,(2020)notes that there are various opportunities involved in the use of ICT for learning and these are that, there is room for

innovation and digital development, it may also enable the designing of flexible programmes, users can be of any age and also that it may enable the strengthening of skills such as problem solving, thinking and adaptability.

Methodology

The article was done using desktop research which entails the review of secondary data sources. The figure below summarises the research model by the researcher. The research model is shown in Figure 1.

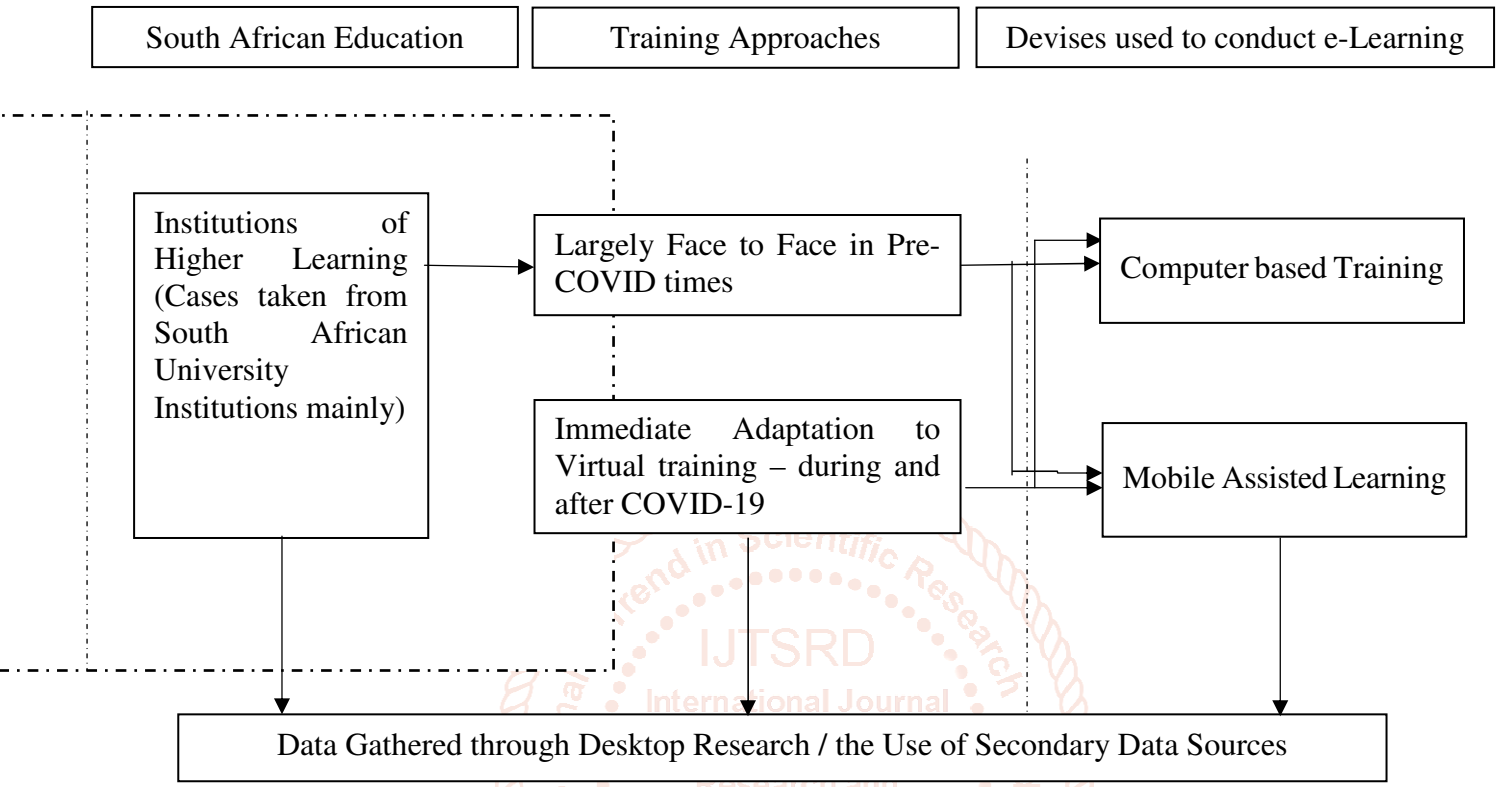

Figure 3: The Research Model (Author, 2021).

The research was mainly focused on the impact of COVID-19 on teaching and learning in institutions of Higher Learning. In this case, the researcher focused on universities. The study appreciated that, in pre-COVID times, learning and teaching was mainly done face to face, and on the onset of the start of the deadly pandemic in South Africa, and Education immediately switched to virtual or online learning and this was computer based. However, due to availability of cell phones in both students and teachers, some resorted to the use of mobile devises as a medium of communication between learners and teachers.

Training Approaches and Devises for Conducting e-learning

It is revealed that in pre-COVID times, most learning was done using face to face mechanisms in most University institutions (Gherheș et al., 2021). However, at the beginning of the Pandemic, most institutions had to move to online learning platforms (Gherheș et al., 2021; Sharma & Alvi, 2021) to enable students to learn whilst in the comfort of their homes. Online learning would in some way, replace face to face learning and allow student and teacher to interact via online platforms. It is also revealed that, during the COVID era, students and staff have mainly relied on the use of Two most significant devises used by students to do online learning are either through the use of computers / laptop and or mobile devises (Laher et al., 2021**;** Elaish et al., 2017; Mardiah et al., 2020). In this case, both students and staff ought to have access to any one of these for online lessons to be conveyed. These activities are interlinked and their connection was established through Desktop Research.

Desktop Research

The study was based on desktop research. Desktop research or the use of secondary data sources to gather data is when a researcher reviews literature relating to the study from other sources or from the work of other scholars (Khalil et al., 2020). In this case, the researcher used scholarly secondary data sources from google scholar that dealt with the shift of class-room face to face learning to online learning during the COVID-19 pandemic. Cases were drawn from the international, regional, and local (South Africa) levels, to get an appreciation of how ICT has become an essential learning tool during the COVID-19 pandemic. The researcher also reviewed the various challenges in online learning during the

course of the pandemic, as well as extract possible solutions to them as well. Coming back home, the researcher looked at two cases of universities in South Africa, one from the city (University of Witwatersrand) and one from a historically disadvantaged rural settling (University of Venda) just to get a feel of the challenges experienced in the two very different universities. Apart from scholarly articles, information on how the two universities tackled e-learning under the COVID-19 pandemic was also gathered on the two university websites. The choice in the two universities was to reveal that, universities in rural settings are usually more disadvantaged from those in the city as they may suffer from other negative impacts such as a disadvantage in geographical location, which may make it very difficult or some students to access the internet. The article also reviews scholarly articles from google scholar relating to how some countries have resolved some of the hindrances experienced during the sudden shift from face to face class-room learning to online learning. The article also helps universities to be better prepared for any unforeseen disaster or natural hazard that may disturb learning in future, by enabling university institutions to easily switch to online learning with less or no difficulties. The study now moves on to the results section.

Results

It can be noted that, the COVID-19 pandemic brought with it, a lot of innovation when it comes to CBT and online learning. This is mainly because, the world had to make way for learning despite the difficult learning environment under the influence of the COVID-19 pandemic. The study also notes that, due to the COVID-19 pandemic and the accompanying policies such as the lockdown policies adopted by most governments in both the developed and the developing worlds, the use of ICT in learning has become an inevitable learning tool for most Institutions of Higher Learning (Ntshwarang et al., 2021;Innocent et al., 2020). This would reduce the loss in student learning time, as they would be expected to learn using the internet on the computer or on mobile phones using either synchronized (real time) or synchronized (non-real-time learning).CBT therefore come with advantages such as the ability of the trainer to train more people at one goal in a standardized way, as well as the ability of the learner to be able to repeat the video at own pace (Schwaninger, 2011). This in turn allows enables teachings to be documented and students can play the video over and over again for better understanding of what was being taught, a phenomenon which may not be possible under face-to-face teaching due to the need to also engage in other courses in a limited space of time. The article also notes that countries that have made advances in digital technologies (before the striking of the COVID-19 pandemic) such as France, Germany and Finland found it easier to shift to online learning(Arnhold, et al., 2020). Whist those with limited or no advances faced much difficulty as was the case with Southern Italy which was lagging in terms of ICT advancements when compared to Northern Italy (Ferri et al., 2020.; Wargo et al., 2021). This showed that, countries with limited ICT skills would face more challenges for both teaching staff and learners.

African countries have not been on an easy road when it comes to adoption of ICT technologies for teaching and learning during the COVID-19 pandemic era. It was also revealed that, the use of mobile phones in learning was more feasible in most African countries due to ubiquity reasons (Kaisara et al., 2021). This comes as a result of the fact that mobiles phones are cheaper to own as compared to computers, which in turn increases the likelihood of African learners to also benefit from online learning through the use of mobile phones. Good internet connection is also an asset when it comes to effectively learning online even when one owns a mobile phone (Kaisara et al., 2021). This then calls for the need for governments to ensure that students learning from various parts of the country are provided with good internet connections, so that students even in remote areas, do not lag behind when it comes to learning.

It also important to note that, most African countries have lagged behind in terms of technological advancements in ICT as indicated by the inability of countries such as Botswana, Zambia, Zimbabwe and Namibiato quickly adapt to online learning (Mukute et al., 2020), and poor skill in users, poor ICT infrastructure in the four Tanzanian universities studied (Innocent et al., 2020), as well as the lack of skill in most teachers to use ICT (Santi et al., 2020). This shows a very huge gap in terms of technological advancements between African nations and countries such as Germany, Finland and France, which were already advancing in remote learning before the COVID-19 pandemic even appeared. to minimise the risk of increased costs, university staff would also face the risk of being retrenched whilst at work and the challenged of increased work (Agyapong et al., 2020).This would in turn reduce peace of mind in tertiary institution workers as they would be faced with the risk of losing their jobs during the time of the pandemic and this would in some way affect worker performance.

In reducing the disparities between nations with advanced ICT and those that are lagging, many

scholars have emphasised the need for government to improve ICT infrastructure in universities as well as develop ICT skills in students (Ntshwarang et al., 2021), as well as the need for African countries to acquaint the cultural, political and economic frameworks with ICT (Kaisara et al., 2021), as well as to teach ICT from primary throughout secondary schooling (Innocent et al., 2020). This would in turn help the local people to view ICT as a normal part of their everyday life and in turn help in the development of a positive attitude by students when it comes to the use of ICT in learning as they proceed up to tertiary education. The article now zooms in on the use of ICT in South Africa's tertiary education and this shall now be discussed at this juncture.

Insights from South Africa

As noted earlier, the COVID-19 pandemic left no continent unturned and unfortunately, South Africa was also affected by the pandemic within its borders. On the 15th of March 2020, the South African President declared a national state of disaster, and this was followed by a national lockdown strategy, and this came at a time when some South African universities where struggling either to commence with the academic year, or to make up for the lost time due to continued student protests which related to various student demands (Landa et al., 2021). South Africa then went under level 5 in March 2020(Wits University, 2020a). In order to manage the spread of the deadly virus, schools had to close down and tertiary institutions had to come up various ways that would allow students to learn while at home(Dzinamarira et al., 2020). This would involve an immediate shift from face to face learning to online learning would not only be a move that would only affect students, but staff and institutions as well.

Lockdowns caught most of the students and staff unaware and this presented these two groups with various levels of unpreparedness as the e-learning process required a combination of having access to ICT resources such as laptops, smartphones, and good internet connectivity, which most South African students from disadvantaged communities did not have (Naidoo et al., 2020). A qualitative study carried out on two universities located in the remote parts of Eastern Cape revealed that it was quite challenging for universities located in remote areas to access online learning facilities which in turn indicated gross inequalities when it comes to educational outcomes of students from different socio-economic backgrounds (Landa et al., 2021). Perspectives et al., (2021)further emphasised on the gap which historical inequalities in the South African landscape created as they had remained persistent throughout the passage of time, and further placed emphasis that, these inequalities affected the e-learning practices especially by students from disadvantaged groups.

Geographical location also presented a major hindrance especially for students in rural areas who receive data bundles from government, but due to poor connectivity, students would struggle to keep abreast with important government and institutional updates, and would in many instances, result in some students often relying on misleading and fake information that increased their fears and anxiety (Naidoo and Cartwright, 2020). A study in one of the South African universities also revealed that, staff could not give students any new work during the initial 21-day national lockdown due to various challenges such as the lack of access to devises and internet by some students and staff (Perspectives et al., 2021), which presented a major learning hindrance to many students within the nation of South Africa.

The South African government should be applauded for its efforts to reduce difficulties in adapting to online learning. It is also acknowledged that, the South African government and the National Student Financial Scheme (NSFAS) committed to themselves to the speedy distribution of laptops to students in need during lockdown period, the laptop procurement process was one that was complicated and contentious, resulting in some students lagging behind when it comes to online academic participation which would in turn affect test and exam performance (Naidoo and Cartwright, 2020). The South African government also injected R12 billion on basic and higher education to address online learning as well as put measures in place to stop the spread when schools open (Perspectives et al., 2021). This would mean better preparations for the re-opening of schools, despite the unpredictable nature of the pandemic, which have mad many nations on a roller coaster-ride of putting emergency partial or total lockdown periods, depending on the intensity of the spread of the pandemic at any point in time, and South Africa is no exception.

In efforts to make online learning more accessible and enjoyable, a study revealed that, a university in South Africa's Eastern Cape Province offered an online platform for off campus students and this is said to have been very useful, and it also supported students by offering support in the form of laptops and data bundles which was something that some students in pre-COVID times were even in need of (Mukute et al., 2020). Laher et al., (2021)also recommends the need of learning platforms such as the Moodle Learning Management System to be used not only as

a depository, but also to be customised by being linked to social media sites (such as WhatsApp or Facebook), video and audio conferencing (You Tube, Zoom, Skype) and other learning resources in order to ensure that interactive learning (both synchronous and asynchronous) are provided for.

In managing the spread of the pandemic in university institutions as lockdowns began to loosen up from level 4 to 3 then level 2, government and university institutions would operate with a set of rules that would help in reducing the spread of the pandemic once students go back to their campuses and these would be observance of social distancing of 1.5m-2Meters for students in lectures, the wearing of masks, as well as hand washing and constant sanitisation among other measures as this was the case of the University of Venda(UNIVEN, 2021;van Schalkwyk, 2021). These measures would present the way students and lecturers are supposed to behave in the post COVID-19 era for the spread of the disease to be effectively controlled. Vaccinations have also been rolled, with South Africa being one of the first African countries to receive the vaccine (Dzinamarira et al., 2021), and South African university staff have started being vaccinated towards the end July 2021 (Naidoo et al., 2020; van Schalkwyk, 2021).Whilst it has been argued that vaccines can only prevent the severity of the disease in patients, it has been revealed that the vaccine does not stop vaccinated people from catching and spreading the virus, though to a lesser extent (CDC, 2021; WHO, 2021b). This calls for the need for people to still practice preventative measures such as social distancing and the wearing of masks among other measures. The study now compares two different university scenarios and how they have been affected during the course of the pandemic.

Comparison of CBT between the University of Witwatersrand and the University of Venda

The study chose two universities, one in the city, and one in a rural setup that is historically disadvantaged. This was to get a feel of how the two universities in these two very different environments had been affected by the pandemic and how they each adopted to CBT as a way of learning whilst away from campuses. It also reveals the challenges faced by the two universities and the various ways in which these two were solved.

University of Witwatersrand

The University of Witwatersrand engaged in online learning from the 20th of April 2020 and this continued for the rest of the year 2020, with the exception of selected laboratory and clinical activities for small groups of students that required students to be physically present (Veller & Bruce, 2020;Wits University, 2020). Post graduate students who would need to access school facilities to carryout experiments would be allowed in to the institution in limited numbers through observation of COVID-19 protocols (Veller & Bruce, 2020; Wits University, 2020). In a study carried out at the University of Witwatersrand on 160 first year and second year psychology students, it was revealed that due to power cuts, students sometimes experienced power cuts which made it difficult to work from home, and also other students expressed that lack of face to face interaction made some courses difficult(Laher et al., 2021).

In order to make the life of the university student easier, students were supported through various forms which included data provision, tutoring and mentoring as well as through provision of counselling services (Wits University, 2020; Laher et al., 2021). Although there have been challenges experienced, the university managed to complete the year 2020 largely through Emergency Remote Teaching and Learning (ERTL). In 2021, the country also experienced a second wave of the COVID-19 pandemic and the institution had to continue with online learning at the start of the academic year and all courses would be provided through the Learning Management System (LMS) and this would be available on student website and also as a mobile app (Wits University, 2021b).The university acknowledged that the society experienced inequalities and that 10%-15% of students had no access to adequate data, appropriate computing devises and a conducive learning environment (Wits University, 2021b). To help make the life of the student easier, the university established a Mobile Computing Bank (MCB) which enabled qualifying students with no access to appropriate mobile learning devises to loan basic devises from the MCB which the costs will added to the student account or reversed if the devise is returned in good condition at the end of the 2020 academic year (Wits University, 2021b).

University of Venda

Established in the year 1982, the University of Venda (UNIVEN) is a historically disadvantaged institution of higher learning located in Thohoyandou which is an administrative centre of the pre-dominantly rural Thulamela Municipality within Vhembe District Municipality of the Limpopo Province of South Africa (Francis et al., 2016). The university is therefore located in the rural parts of the country. Traditionally, rural lecturers have been known to suffer from work overload, lack of educational equipment and facilities(Kirklady, 1996). Francis et al., (2016) supports that the poverty evident in

Vhembe District and other areas in rural South Africa is mainly rooted in the discriminatory policies of the Apartheid system that was implemented prior to 1994 when the country attained its democracy. In this regard, rural universities will be most likely to suffer more disadvantages when it comes to effectively adoption to online learning facilities when compared to universities better placed in cities. It was revealed that, some of the challenges faced by students at UNIVEN included the lack of laptops to enable them to learn and the inability of students to thoroughly interpret instructions sent on the various learning platforms such as via e-mail and WhatsApp(Bhengu, 2020). Absa Group also joined to assist some of the most historically disadvantaged universities by donating R5 million in the year 2020 to provide learning devises and data for students and UNIVEN received 100 devises which the university would distribute on its own (Absa, 2021). This would in turn improve the lives of students when it comes to online learning. The article now looks at the discussion section.

Discussion.

The article now discusses findings as found in the case of South Africa by looking at how the country has adopted to the new way of learning which is largely online. It also looks at challenges and their implications and the government and other bodies would aim at solving these. First priority shall now be given to the theoretical implications, then this shall be followed by practical implications.

Theoretical Implications

The study appreciates the TAM model which appreciates how people come to accept technology (Urhiewhu et al., 2015)by stressing that in situations where people are presented with new technology, their attitude, perceived use and ease of use determines the rate of use (Davis et al., 1996; Urhiewhu et al., 2015). It is therefore evident from the case of South Africa that, challenges in using technology were experienced also due to lack of skill on how to use ICT in both the teacher or lecturer and the learner (Perspectives et al., 2021; Ferri et al., 2020; Naidoo et al., 2020). This would in turn affect the effective use of ICT for both teacher and learner and hence, the need for training on both the part of the part of the learner and the staff. TAM has therefore been an effective tool by researchers and practitioners to see the rate of acceptability of ICT (Davis et al., 1996). In this case, the trainer or the teacher and the students must be well equipped with ICT skills for them to have a positive attitude towards utilising technology in conveying lessons as well as in learning for students.

Practical Implications

It can be noted that from the article that, South Africa did fell prey to the COVID-19 pandemic and on the 15th of March, the occurrence of the pandemic in the country was marked as a national disaster (Landa et al., 2021). Schools, universities and vocational training centres had no option than to close as a result of the deadly and fast-spreading nature of the pandemic. Such developments would imply the need for tertiary institutions to adopt to the new norm of learning which would be largely through online platforms (synchronous or asynchronous modes) in order to prevent learners from lagging behind.

Unfortunately, everything was not smooth when the national lockdown hit as evidenced by lack of access to e-learning resources in the form of laptops and smart phones, poorinternet connectivity, poor geographical location for some students(Naidoo et al., 2020). In such cases, students are not presented with opportunities on the same platforms, and this may result in students who are better placed in terms of access to resources and geographical location to benefit more than students from disadvantaged backgrounds. In this case universities located in rural areas such as UNIVEN suffered more when it comes to limited access to laptops and internet, as compared to universities in the city such as Wits. In easing the burden on historically disadvantaged universities Absa Africa lended a hand by donating 100 devises to UNIVEN (Absa, 2021). This would in turn improve the ability of students to learn via e-learning platforms. At the University of Witwatersrand, only 10-15% of students was said to have no access to enough data and computing devises as well as a conducive learning environment (Wits University, 2021b), and through the establishment of the MCB students gained access mobile learning devises through a loaning facility (Wits University, 2021b). This indicates the positive efforts made by more advantaged universities in improving the lives of students.

The article also notes that, through researches by some scholars, some universities in South Africa could not give students new work during the 21 day lockdown period due to limited access to ICT devises and the internet by some students and members of staff (Perspectives et al., 2021), and some of the government and the NSFAS efforts to correct this challenge was through distribution of laptops during lockdown (Naidoo et al., 2020). A university in Eastern Cape Province was also noted to also offer support by providing students data bundles and laptops (Mukute et al., 2020). This showed great concern by some universities, the government and the

NSFAS to make the life of the ordinary student better, especially those that came from poor backgrounds.

It was however noted that, the distribution of laptops by government was one complicated and tiresome process which in turn affected student performance in tests and exams (Naidoo et al., 2020). This also shows an uneven ground for students as some were greatly affected by the occurrence of the pandemic in South Africa the injection of the R12 billion by government on basic and higher education to assist with online learning(Perspectives et al., 2021), would go a long way to assist institutions of higher learning even during the post-COVID era as it would go a long way in assisting institutions and students with online resources, thus, reducing hustles associated with shortage of ICT in institutions, and for students and staff as well.

Apart from the training of both staff and students to familiarise with ICT, (Laher et al., 2021) also suggested the need to customise learning platforms as Moodle with social media platforms such as WhatsApp and Facebook as well as other platforms such as Zoom, Skype and You Tube. Customising learning to other platforms that are more familiar with the youths would help in conveying information much faster between the learner and the instructor of the teacher and this would help students to keep abreast with the current information when it comes to learning and news updates.

In re-opening of schools as COVID-19 cases go down, students have been encouraged to practice social distancing, the wearing of masks and constant sanitising (UNIVEN, 2021), whilst university staff have been encouraged to be vaccinated since it is believed that the disease would be less severe to those vaccinated (UCT 2021; Wits University, 2021b; WHO, 2021c).These moves would help universities to open with people being more aware of stricter measures to prevent the spread of the pandemic and to allow more students to be accepted in university campuses.

Conclusion and Recommendations

It can be concluded from the above article that, the COVID-19 pandemic could be here to stay, as evidenced by the unpredictable nature of the pandemic and the immediate (partial or total) lockdown measures by governments to manage the pandemic, depending on intensity of the disease in a country at one point or the other. It then becomes critical for staff and students to all brace their selves for improved ICT skills and develop a positive attitude towards ICT so that minimal disturbances are experienced during the peak of the pandemic when it comes to students learning, and also to prepare (both institutions, staff and students) them for other unforeseen pandemics that may crop up in future. The study therefore recommends: -

- Improved ICT infrastructure in universities so that staff becomes familiar with new technologies which in turn makes it easier to teach students
- Put in place affordable loan facilities (or include in students fees) which enables students to at least afford a laptop so that they also familiarize themselves with e-learning as it will become a basic learning requirement – in this case, the gap between the poor and the rich students will be minimised as everyone will then have access to a laptop at least
- There will also be need for specific data for learning for students and this will prevent students using the data for other purposes which may not be academic, in turn make them available to access online material when it comes to learning time
- Students should continue being educated about the importance of continuing with preventative measures such as social distancing, the wearing of masks and constant sanitization and hand washing so as to curb the spread of the pandemic.

There will also be need for government to invest in infrastructure to extend bandwidth as demand for internet would have increased, so in order to cater for both the working class and the students, bandwidth should be strengthened.

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