Covid-19 pandemic: A necessary catalyst for e-learning adoption and application

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ABSTRACT

The Covid-19 pandemic brought the world to a grinding halt, adversely affecting almost every sector including the post school education and training (PSET) sector. The South African PSET sector is no exception. The academic enterprise was abruptly disrupted and led to a serious loss of teaching and learning time as the government passed new regulations discouraging movement and physical meetings of people. The state of disaster regulations and lockdown directives pronounced during March 2020 by the South African government presented an unprecedented way of operating since the formation of many higher education institutions (HEIs). This study assesses the state of e-learning before and after the first six weeks of lockdown regulations in two HEIs, using a theoretical framework of e-learning system readiness assessment and a participatory research approach. The study reveals a state of under-preparedness by HEIs to operate under the lockdown regulations, due to the adopted blended learning policy implementation gap. Based on these findings, the study concludes with an argument that the Covid-19 pandemic presented a great opportunity for HEIs not only to adopt e-learning at the policy level but also to adapt to the new e-learning methods and practices and thus prepare universities for times of uncertainty.

Keywords: Covid-19, post school education and training, e-learning, teaching & learning, higher education institutions

Categories: • *Applied Computing ~ Education, e-Learning*

1 INTRODUCTION

The ultimate lockdown regulations pronounced at the end of the month of March 2020 by the South African government brought about an unprecedented way of operating after the formation of many HEIs in the country. This exposed the non-existence of an emergency plan to conduct teaching and learning outside the conventional norms of physical classes. The extent to which the Covid-19 pandemic had an impact, or lack thereof, on accelerating the implementation of e-learning in the PSET sector in South Africa remains innumerable.

The Covid-19 pandemic presented a situation where physical gatherings were discouraged and wearing masks and maintaining social distancing was encouraged as the best defence mechanism to contain the transmission rate. HEIs were compelled by materialistic conditions to devise new business models to advance their educational interests. This led to a radical shift in teaching and learning and brought about the implementation of e-learning systems. Clark and Mayer (2016) defined e-learning as learning that is conducted via electronic media and resources mostly over the internet. As simplistic as it may sound, e-learning implementation was characterised as the opposite.

The South African Department of Education (DoE) (2003) accounted that its HEIs enjoyed different internet standards and viewed this as a contributing factor against e-learning systems adoption. Notwithstanding this challenge, HEIs in South Africa made serious strides towards adopting e-learning, at least at the policy level. Bagarukayo and Kalema (2015) reported that HEIs had since adopted various technology solutions to support their daily operations; not only in teaching and learning but also in support services. These included learning management systems (LMSs), online registration platforms and financial management systems among others. However, Bagarukayo and Kalema (2015) reported that LMSs were not fully utilised due to the nature and design of most universities which is contact mode driven, with only one distance learning university in the country. The unprecedented deviation from the contact mode of provision was granted by the Council on Higher Education (CHE) as a temporary measure, owing to the Covid-19 pandemic. In a communique on 20 November 2020, the CHE extended what it referred to as "the Concession for Programmes Accredited for Contact Mode of Provisioning to Continue to be offered through Remote Online Distance/Blended Modes of Provisioning" until the end of the 2021 academic year. Effectively, this implies that South African HEIs will continue to build and reap the rewards of the abrupt infrastructure development that supported teaching and learning, as well as research. This advancement could largely be attributed to the Covid-19 pandemic as it brought together all the stakeholders of the South African PSET sector and rallied them behind supporting the implementation of both new and old infrastructure technologies.

Most infrastructure technologies that have since been and continue to be implemented in the South African PSET sector are not new, i.e. they were not invented to support the academic enterprise as a direct result of the Covid-19 pandemic. The LMSs such as BlackBoard, Moodle, etc. had been adopted by a majority of South African HEIs long before the virus outbreak, but with little or no support for implementation as demonstrated in the literature review of this paper. Similarly, team collaboration applications such as Skype, Zoom, and MS Teams had been available for PSET sector use long before the Covid-19 pandemic. However, the effective power of these technologies had been ignored, neglected, undermined, or was unknown by modern society including HEIs. To test this hypothesis, this study examines the guiding regulatory frameworks of the South African PSET sector, university Information and Communication Technology (ICT) policies and practices compared to at least five ICT advanced PSET sectors and universities from around the world.

The rest of this paper is arranged as follows: Section 2 presents the motivation of the study

and Section 3 presents a critique of the existing literature. Section 4 presents the research questions. The objectives of this paper are presented in Section 5, followed by the research methodology that guided this study in Section 6. The data collection and results are presented in Section 7. The discussion and recommendations are presented in Section 8 and 9, respectively. Finally, Section 10 presents the conclusion and projected future work arising from this study.

2 MOTIVATION OF THE STUDY

This initiative is meant to contribute to the body of knowledge in the research field of e-learning with special reference to its adoption and implementation in higher education. The key element of this contribution is the evidence-based outcomes and recommendations to the PSET sector's leaders, policymakers and administrators on how e-learning systems could be better supported and managed in view of the abrupt transition witnessed.

3 LITERATURE REVIEW

This section seeks to present a critical review of how the Covid-19 pandemic has had a meaningful contribution to fostering a change of delivery mode in the PSET sector. The review uses a three-pronged approach that focuses on (i) government policy framework for integrating ICT solutions in teaching and learning against the application of the same, (ii) HEIs policy framework on digital education strategy against action plans and (iii) global best practices for the adoption and application of e-learning pedagogy. Finally, this section presents an informed analysis of how the Covid-19 pandemic has impacted teaching and learning practices in the PSET sector.

3.1 Government policy framework for integrating ICT solutions into teaching and learning

It was argued by Zanjani et al. (2017) that HEIs have for a long time been under immense pressure to implement e-learning systems to conduct teaching and learning. According to Mtebe, 2015, the greater focus of the Zanjani et al., 2017 study was on the adoption and application of LMSs, related collaborative tools and other available systems in higher education involving the digital footprint of students. Holmes and Prieto-Rodriguez (2018) stated that LMSs provided better continuity, reliability and student privacy than other platforms. Therefore, it became the primary platform used by many universities, irrespective of whether they used proprietary or open-source software. Bagarukayo and Kalema (2015) argued that while there was pressure to adopt e-learning, there was a lack of uniformity in application and this lack of a coherent approach created the possibility that the full potential of e-learning might not be realised. However, as asserted by the 2021 Technology and Innovation Report by Canton (2021)

"Recent developments in frontier technologies, including artificial intelligence, robotics and biotechnology, have shown tremendous potential for sustainable development". It remains to be seen whether the South African PSET sector, particularly the historically disadvantaged institutions (HDIs), took advantage of any development towards the adoption and application of online methodologies for teaching and learning.

A self-critique by the Department of Higher Education and Training (DHET) in its Revised Strategic Plan 2020–2025 admits that a challenge in the PSET system is the "mode of delivery and technology". Effectively, the Revised Strategic Plan 2020–2025 admits that the delivery modalities of programmes are still predominantly traditionally lecturer-centred, and that there is limited use of technology for blended learning approaches. The few colleges that use distance provision still use the traditional correspondence paper-based model, which does very little to support student success and has also been associated with poor success rates in the South African university sector. The availability of ICT infrastructure varies from college to college and is a major constraint in the utilisation of ICTs to improve teaching and learning". This self-criticism and admission by the DHET are sufficient to present the situation in the PSET system concerning ICT adoption in general and in particular e-learning. In clearer terms, ICT and e-learning adoption was never prioritised before the Covid-19 outbreak and thus the Annual Performance Plan 2021/22 committed to "expanding online learning in PSET". Regarding the expansion, the Annual Performance Plan 2021/22 states that "the Minister identified the need for online, multi-modal and blended modes of delivery to be deployed across the PSET system. This includes the building of capacity to deliver multi-modal education and training, e-learning materials development and deployment and the development of rigorous support systems to support lecturers and students". In a nutshell, only after the Covid-19 outbreak, the PSET began demonstrating some level of commitment to e-learning. However, this is not a surprise as the Commonwealth of Learning (2020) asserts that globally, "no one was prepared for the unprecedented learning crisis that needs to be addressed immediately".

3.2   HEIs policy framework on digital education strategy

The levels of unpreparedness on a global scale are informed by a range of factors such as the "lack of ubiquitous access to computers and the internet", as accounted for by the Commonwealth of Learning (2020). However, the major factor and the fundamental reason was the lack of political will by governments and education institutions to appreciate and embrace the potential and power of available technologies towards achieving national development goals. Even major economies such as the United States of America (USA) showed little appreciation of online learning before the Covid-19 outbreak, as it was only used by 15% of total undergraduate students by the end of 2019, according to Encoura, 2022. Aziz et al., 2020 reported that "since the start of online learning in 2013, it has not become a popular method not even in China. However, during the pandemic situation, it has become quite popular". According to Ngwacho, 2020, countries such as Italy, France, Germany, Australia and the United Kingdom (UK) had to "quickly enhance their e-learning platforms (Moodle, LMS, cloud systems, etc.) to

create common distance learning centre portals and provided students access to e-content and repository, due to the use of mobile devices". Similarly to the case of South Africa and many African countries, the Covid-19 outbreak proved to be a necessary catalyst for generalised e-learning adoption and application.

We argue that the Covid-19 outbreak proved to be a catalyst for the adoption and application of online learning simply because most governments boosted it with clear policies on ICT and education dating back decades before the Covid-19 outbreak. Consequently, "Nepal has formulated several ICT and education-related policies since 2000; however, the challenges it is experiencing in the advent of Covid-19 are mainly due to its faulty implementation strategies and inability to implement those policies" (Dawadi et al., 2020). The White Paper for PSET (WPPSET) approved in 2013 laid the basis for the implementation of ICT solutions in the South African education system, but there was a lack of support for its implementation. This lack of political will can also be deduced from emerging trends by various governments and education institutions targeting the expansion of online learning, increasing access to broadband connectivity and the development of strategies to provide remote support. For example, in countries such as South Africa, Kenya, Nigeria, and India, the governments have since designed a strategic plan to support remote learning (Jena, 2020; Ngwacho, 2020; Ozili & Arun, 2020). Similarly, universities also presented clear policy directions on the integration of ICT solutions in teaching and learning.

3.3 Global best practices for adoption and application of e-learning pedagogy

The Learning and Teaching with Technology (LTwT) policy of Walter Sisulu University advocated for the implementation and expansion of technology in teaching and learning. Similarly, the teaching and learning policy of the University of Fort Hare (UFH) equally advocated the promotion of blended learning by academic staff, thus highlighting the centrality of technology to enhance the student learning experience. Conversely, the University of Johannesburg (UJ) policy on teaching and learning advocated the "use of technology in the formal classroom and extending flexible learning opportunities into the wider community". Also, the University of Cape Town (UCT) "strongly encourages the use of blended pedagogy within courses and across qualifications;" notwithstanding the Senate permission for the offering of "more than 20% of total credits in fully online mode", for its undergraduate programmes. The common feature of these university policies is that they included ICT adoption for integration with teaching and learning long before the outbreak of the Covid-19 pandemic, albeit the lack of implementation detailed in their respective reviews.

In contrast to their counterparts from other first-world countries, the University of Oxford (2016) adopted its digital education strategy in 2016, which "established a framework for engagement in digital education by setting out structures, resources and approaches to enable the university to change its use of technology in teaching and learning". Since then, the University of Oxford reported that they have made progress in their online offering and

this was accelerated even more by the Covid-19 pandemic. Similarly, the University of Cambridge (2016) developed a digital strategy for education to provide a framework for developing the use of technology to support education. This strategy "is supported by an action plan, which outlines initiatives to meet each goal, primary stakeholders with responsibility or line of reporting/review, and appropriate timescales for completion".

This subsection depicts a picture of the existence of a sound policy framework for the adoption and application of e-learning in the PSET system, both locally and globally. Increasingly, even top-ranked global universities showed a lack of implementation effort in their digital education strategies. In essence, the integration of technology in teaching and learning remained at the policy level, as opposed to practice. This could be attributed to a lack of an informed and coherent action plan by various HEIs. Thus, even by their admission, the Covid-19 outbreak forced the majority of HEIs to begin to appreciate the power of available technologies currently being used. In support of this literature review, this paper presents the instant impact of Covid-19 on the adoption and application of available technologies, based on data collected from two HEIs in South Africa.

4   RESEARCH QUESTIONS

This paper sought to address some pertinent questions arising from an instantaneous e-learning adoption and implementation observed in the South African PSET sector during the Covid-19 pandemic. The main question this paper sought to address is as follows:

4.1   Main question

What was the state of e-learning implementation in the South African PSET sector before and during the coronavirus outbreak?

This question is posed to assist the investigation process to adopt and apply the necessary scientific methods to understand the influence of Covid-19 or lack thereof on the sector. Additionally, this paper sought to address the following sub-questions in an attempt to lead a focused investigation towards understanding the impact of Covid-19 on e-learning adoption and implementation.

4.2   Sub-questions

  i. *What was the ICT policy direction of the PSET sector towards adopting and implementing e-learning prior to the coronavirus outbreak?*

 ii. *What has been an experience-based influence of the Covid-19 pandemic in the South African PSET sector towards e-learning adoption and implementation?*

iii. *How has the state of readiness or lack thereof affected methodologies of teaching and learning during the e-learning implementation phase?*

5   OBJECTIVES

The overall aim of this study is to assess the state of e-learning usage before and during the various levels of lockdown regulations in two HEIs in the Eastern Cape province to understand the extent to which the Covid-19 pandemic has accelerated the adoption and implementation of online methodologies in teaching and learning. The following specific objectives were set:

i. *To critically review existing literature and policy positions on the original plan of action for the adoption of online methodologies in the PSET sector.*

ii. *To investigate the extent to which the implementation of e-learning has increased the university's multimodality to teaching and learning and report on the teacher and learner experiences.*

iii. *To assess the infrastructure deficit experienced by students and academics in their efforts to save the 2020 academic calendar through e-learning adoption.*

6   RESEARCH METHODOLOGY

This study applied both quantitative and qualitative methods to provide appropriate guidance about the various dimensions of the study, which include a systematic literature review and data collection and analysis procedures. Through a quantitative approach, a non-experimental design approach was adopted to understand the impact of the Covid-19 pandemic on compelling HEIs into adopting and implementing e-learning. Effectively, a purposive sampling method was used to choose two HDIs, herein referred to as University A and University B. The ICT undergraduate students and computer science undergraduate and postgraduate students including respective academic staff were targeted at University A and University B, respectively. The sample purposely focused on these two departments as the concept of e-learning could resonate very well with their purpose of existence. For this purpose, a structured questionnaire was designed to accommodate both students and lecturers. This approach proved insightful in identifying factors that influenced radical technology transformation in these two HDIs and Alshaher's conceptual e-learning system readiness assessment (ELSRA) framework was used as a baseline in the university's state of readiness analysis (Alshaher, 2013). Additionally, this study followed a qualitative research approach and thus centred the study within phenomenological research, to gain insights into the experiences of both students and academics concerning the phenomenon of the Covid-19 pandemic and teaching and learning pedagogies in the two HDIs. The main reason for adopting this mixed-method approach was to lay grounds for generalising the findings of this study and further articulate the meaning of the phenomenon of the Covid-19 pandemic as a catalyst for e-learning adoption and application, as conceptualised by Creswell and Creswell (2018).

7   RESULTS

A survey questionnaire was designed and circulated among tertiary students of two historical disadvantaged institutions located in the Eastern Cape, South Africa. This was purposive sampling, targeting students from first year to the postgraduate level of two departments (Computer Science and ICT).

7.1   Age group and level of study

An analysis of the age and level of study of participants is pivotal to also give a proper account of who the participants are and what level of study they are in, which is significant to show whether the various ages and various levels of study have different perspectives and experiences with e-learning applications. Figures 1 and 2 demonstrate where the large participation comes from in terms of age and study level. Major participation is from ages 22–27 while in the study it is from levels 2 and 3. These are students who would have had a year or more within the university setup who have participated in various studying platforms. This is followed by the age group 17–21 which comprises mostly first time entries at the university, who have just been introduced to the university environment.
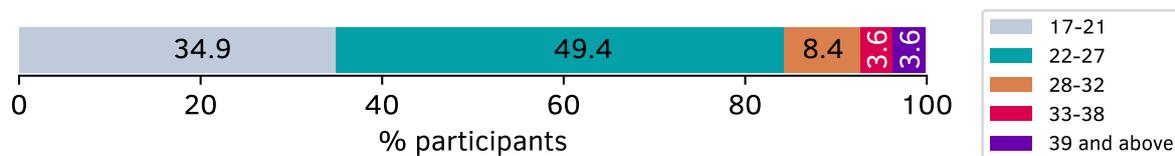
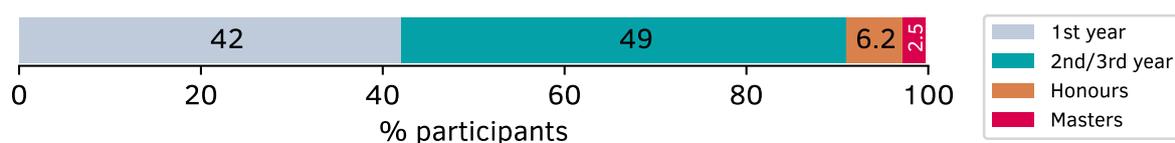Figure 1: Age of participants in years.

Figure 2: Level of study.

7.2   e-Learning concept understanding and use before Covid-19

Similarly, students in the majority confirm to possess a basic understanding of e-learning. Almost 60% of participants said they know e-learning. Almost 30% of participants were not sure if they knew enough to answer the question about e-learning. This group is largely from first year level of study. We argue that this is also informed by the change in the environment. Lastly, just over 10% confirmed that they did not know the concept. Figure 3 must be looked at
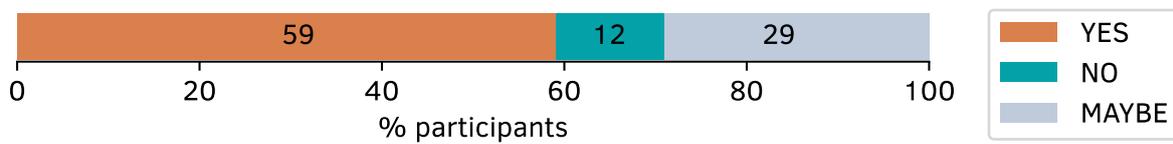
Figure 3: Understanding of the e-learning concept.

as well as the concept reflected in Figures 1 and 2 Based on this response presented in Figure 3, it is safe to conclude that most of our participants understand the concept of e-learning.

Figures 4 and 5 summarise whether according to our participants they had ever used e-learning services before the Covid-19 era in their learning environments. Figure 4 has the highest response with 77% of participants saying NO and just 19% saying YES. This links with Figures 5 where each participant was asked whether they had performed any tasks on the platforms. Over 51% of the participants said they had never performed any task, while 32% confirmed they had only accessed notes and learning materials.
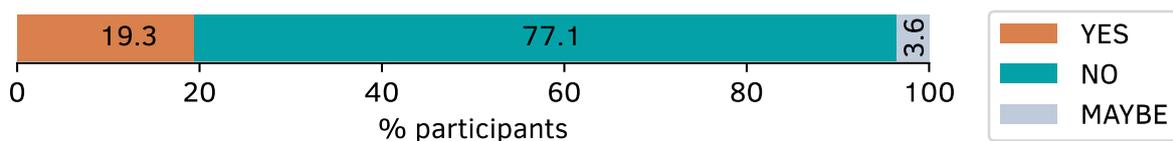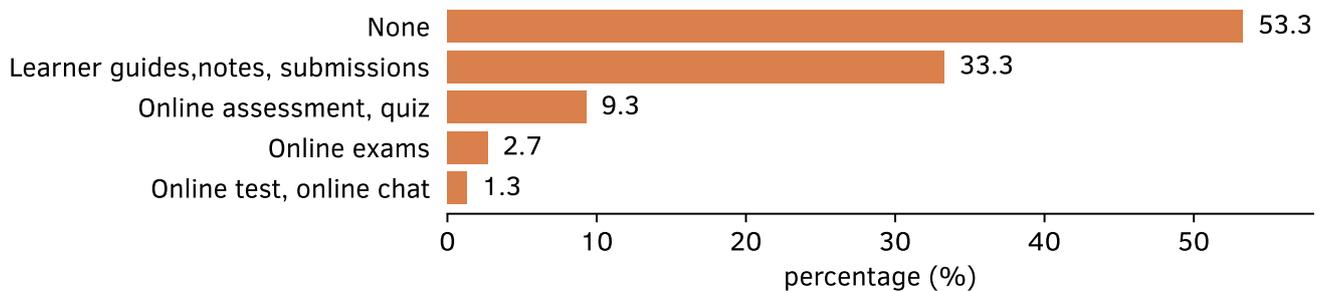

Figure 4: e-Learning use before Covid-19.

Figure 5: Use of e-learning service before the emergence of Covid-19.

7.3   e-Learning application during Covid-19

Figures 6, 7 and 8 present a summary of activities, tasks and usage of e-learning services during Covid-19. Figure 6 shows us a drastic increase in the use of e-learning (compared to Figure 4) while Figure 7 summarises which main tasks are being done and Figure 8 shows which platforms are used in the majority by participants. In summary, the figures show how during the

Covid-19 era changes happened. Figure 4 showed us that there was minimal implementation of e-learning before Covid-19 appeared.
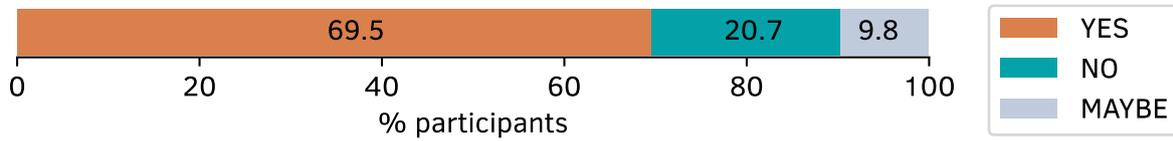

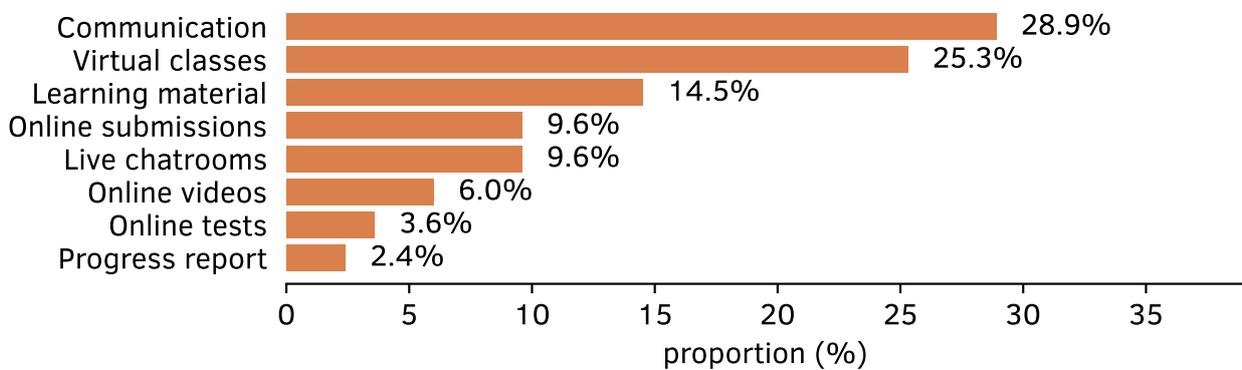Figure 6: e-Learning use during Covid-19.

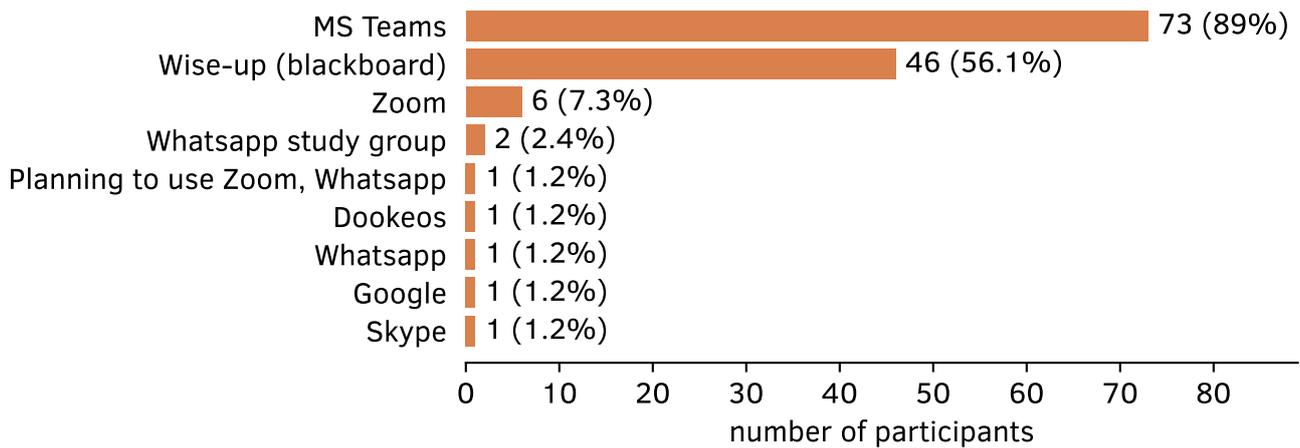Figure 7: Activities done on e-learning during Covid-19.

Figure 8: Platforms used by students.

7.4   University technical support for students to have access

This section presents data about the level of technical support if any, provided by universities to students to access and use e-learning systems during the pandemic.

Figures 9, 10 and 11 demonstrate that some strides were made by universities to provide devices for access to e-learning services, thus providing data for remote access and technical support to provide short training and support to students during submissions and access to learning material. All three graphs show the support while some still offered aid in the form of resources concerning data and the use of devices. Figure 9 shows that universities provided laptops for the first time during Covid-19 to their students, while Figure 10 showed 80% of participants saying that their means of connection depended on the university's provision of data.
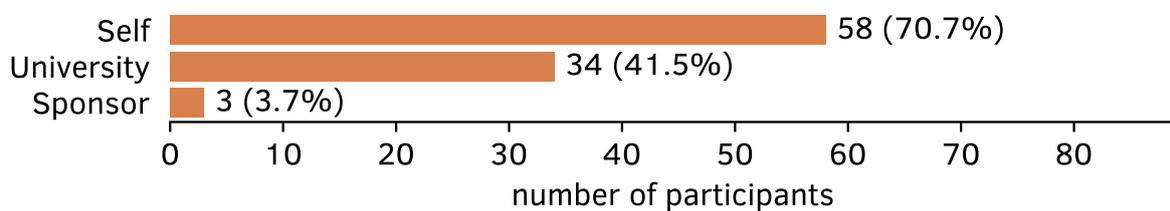
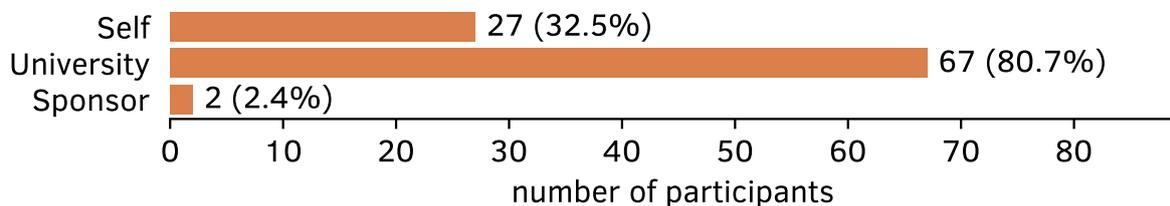Figure 9: Provider of accessed devices.

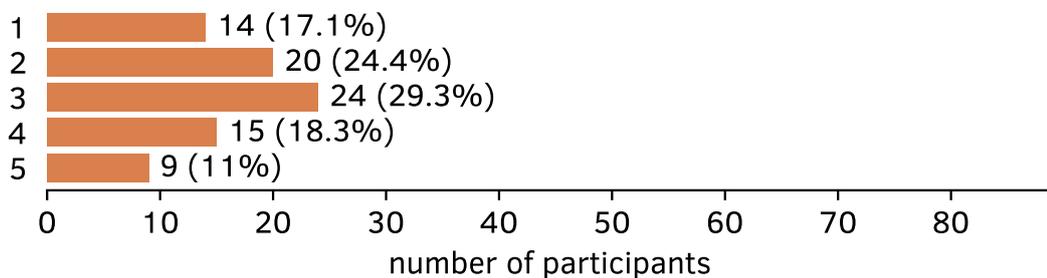Figure 10: Provider of data to connect remotely.

Figure 11: Rating of technical support provided by the university.

8   DISCUSSION

Towards achieving the overall aim of this study, which is to determine whether the Covid-19 pandemic has accelerated the adoption and implementation of e-learning or not, the following themes are drawn from the collected data to discuss the findings.

Theme 1: Knowledge and experience of e-learning

In line with our purposive sampling approach, this theme sought to verify, as an entry point to the discussion, if the participants were knowledgeable and experienced about the central research aspect of e-learning. Alshaher (2013) reported that measuring students' knowledge and information technology skills before introducing a new system is a critical factor in assessing the state of readiness. The responses to the questions: "would you say you understand what is e-learning", "e-learning use before Covid-19", and "use of e-learning services pre-Covid-19" provide the basis for our discussion for this theme. For each of the three categories, varying responses were collected. In the category of "would, you say you understand what is e-learning", about 59% of the respondents claimed to know what e-learning is, 12% claimed to not know and 29% were not sure. This suggests that 59% of the participants were knowledgeable about e-learning and thus were fit for the purpose. In the category of responses "e-learning use before Covid-19", about 77% of respondents said they had never used e-learning platforms before the Covid-19 outbreak. 19% had used e-learning and only 4% were not sure. The mode from this category is 77%, suggesting that most of the respondents never used e-learning. What can be deduced from these two categories is that even when respondents had never used e-learning they knew what e-learning was. Probably, therefore they were able to respond to the category regarding "use of e-learning services pre-Covid-19".

In this category, the mode reflected that 51% of the respondents had never used e-learning services before Covid-19. Notwithstanding the positive attitude towards ICT policy directions at the time, the experience of the respondents showed a lack of policy implementation. Furthermore, these results showed that 77% had never used e-learning before, which showed that the skills dimension of Alshaher's framework showed that universities were simply not ready to introduce e-learning systems. By extension, this could mean that even academic staff were not ready to manage the e-learning programmes to support students, as the respondents included both staff and students. Therefore, it can be deduced that there was no "sufficient manpower" as Alshaher (2013) refers to it in the ELSRA staff dimension, to ensure the proper adoption of the e-learning system.

Theme 2: e-Learning application during Covid-19

The responses show that the use of e-learning during Covid-19 registered a sharp increase to 70% which is consistent with the global trends on how Covid-19 changed the status quo. This is also evident from the responses on "Activities done by users on e-learning during Covid-19",

which showed that communication and virtual classes were increasingly being done online. These activities were conducted mainly on Blackboard and Microsoft Teams, as depicted in the platforms used by students' responses (Figure 8). In essence, e-learning began to characterise the mode of operation in these two universities, as a result of the Covid-19 outbreak. This answers the question of whether the Covid-19 pandemic had any influence on the adoption and implementation of e-learning in the South African PSET sector.

Thus, the experience of the respondents demonstrates that e-learning usage drastically increased during the period of the Covid-19 pandemic. Based on the results presented in Theme 1, the exponential increase in e-learning system usage was by accident, not by design. This is contrary to Alshaher's contention on the e-learning strategy that it must be a "systematic and comprehensive plan of action designed to ensure the success of a broad-based e-learning initiative that adds value to organisations in ways that are supportable and sustainable" (Alshaher, 2013). The exponential increase in e-learning system usage without "sufficient manpower", as argued in Theme 1, meant that universities could not guarantee the provision of the necessary support and sustainability of the project, as discussed in Theme 3.

Theme 3: Infrastructure deficit experience

It was evident from the literature review that HEIs did little to create an enabling environment for e-learning implementation. The data in the "Device to have access provided by?" category showed that students were self-reliant at the beginning of e-learning implementation in terms of devices. However, the data in the "provider of data to connect remotely" category showed that HEIs played a big role in providing data for connectivity to e-learning platforms. Probably, loading student data was an easier intervention for HEIs, compared to other interventions such as purchasing equipment and providing training education and technical support. Alshaher (2013) argued that training and education are critical factors for e-learning users such as the project team, staff and students, as this factor familiarises stakeholders with the concept of the e-learning system. Finally, the data also showed an unstable but above-average performance of HEIs in the "Technical support provided by university" category.

This demonstrated two things: first, the efforts of the universities to provide great service in a time of need; and second, their inexperience in playing this role. Teaching and learning were affected by the HEIs' poor state of readiness to implement e-learning solutions, as the data showed that at the beginning of e-learning implementation, students had to rely on their own resources. In a third-world country like South Africa, with a leading global inequality ranking, some students might have been adversely affected by a lack of access to resources and a poor state of readiness. Where there was a chance for students to use their resources to participate in the e-learning programmes, universities were certainly not ready for this project at that time. Alshaher (2013) proposed that technology is "one of the important requirements of the success of an e-learning system" and that access to technological resources had to be made easy and fast, to allow stakeholders to consume hosted e-learning material and ensure that teaching and learning enterprises were not compromised. This is contrary to what was

depicted by the data presented in this theme and Theme 4 further alludes to this experience.

Theme 4: Impacts of abrupt implementation of e-learning

As a pedagogy, online learning has some prerequisites for efficiency and effectiveness which include time, tools, resources, knowledge and skills (University of Witwatersrand, 2021). Data on the "during Covid-19 e-learning use" and "Activities are done by users on e-learning during Covid-19" categories showed that the Covid-19 outbreak pushed HEIs towards emergency capacity building based on available technologies; as reflected in the "platforms used by students" and "provider of data to connect remotely", categories, among others. The data presented in Figure 7 showed that only 14.5% of activities done online could be attributed to "learning material", which implies that e-learning systems presented limited content for consumption, as opposed to virtual classes and live chatrooms.

It can be deduced that this manifestation confirms Alshaher's (2013) argument that "for some organisations, it might be difficult or undesirable to transfer certain training content to the internet or an intranet". Consequently, Alshaher demonstrates that "work processes that require certain physical skills may not be practical or feasible to teach using a computer". In essence, no under-prepared university could have successfully transferred training content online overnight, and limited activities relating to learning material could suggest that indeed universities were not ready. Additionally, the Covid-19 outbreak was extremely effective in demonstrating to HEIs and governments that their long-standing commitment to integrating technology in teaching and learning can now be realised fully. It demonstrated that such required technology is now available and experiential learning (learning by doing) is the best teacher in terms of building knowledge and skills. However, a better-prepared university could have chosen the appropriate technology including the e-learning platform before the e-learning course design alone, as Alshaher's ELSRA provides guidance on. However, the opposite paints a clear picture of what was the state of e-learning implementation in the South African PSET sector before and during the coronavirus outbreak.

9 RECOMMENDATIONS

Due to the position reflected in the literature review, Alshaher's (2013) ELSRA and the data analysis of this study, the following is recommended:

i. The implementation of government and HEI policies on digital education, given the radical shift caused by the Covid-19 outbreak in the PSET system, should take place with immediate effect.

ii. HEIs should now devise clear digital education policies, such as those provided by UCT, to comprehensively articulate the framework and modalities of e-learning implementation.

iii. Continued efforts should be made to build and reap the rewards of the limited infrastructure development that support teaching and learning towards the realisation of blended learning.

10   CONCLUSION

This study embarked on a data-driven research journey and reviewed literature that discussed how effective the Covid-19 outbreak was in accelerating the adoption and application of e-learning in the PSTE sector. The literature review clearly showed that before the Covid-19 outbreak the policy framework facilitated the adoption of e-learning in the PSET sector, notwithstanding the lack of implementation to date. The data analysis supported the literature review findings that showed that students and academics overwhelmingly stated that they had never used e-learning before. Thus this study concludes that Covid-19 was a necessary catalyst for e-learning adoption and implementation because both governments and HEIs had committed to technology integration with teaching and learning even before Covid; however, implementation was severely lacking. Based on the findings of this study, it would be of great interest to understand the extent of implementation of e-learning under the prevailing post-Covid conditions.

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