Evaluating Technology-Enhanced Teaching and Learning in Zimbabwe's Public Universities

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Abstract

Public universities from different parts of the world have experienced substantial digital transformation since the emergence of the COVID-19 pandemic. The pandemic forced many public universities to adopt remote teaching and learning systems using relevant technologies. Technology-enhanced teaching and learning (TETL) cuts the barriers of distance, cost and time. If implemented effectively, TETL contributes towards inclusive and fair education to promote lifelong opportunities for all as embedded in SDG 4. This study evaluates the integration of TETL at Zimbabwe's public universities. Literature suggests that public universities in Zimbabwe have committed to embracing TETL but this has been met with challenges such as obsolete ICT infrastructure, limited bandwidth and lack of ICT gadgets for students and staff. This study adopts a qualitative approach and applies the information systems success model towards studying this phenomenon through a descriptive case study of two public universities in Zimbabwe that were selected through simple random sampling. The study endeavours to fill the gap in literature where limited research on TETL citing Zimbabwe's public universities was observed. The study purposefully sampled students, academic and administrative staff to participate in focus-group discussions and in-depth interviews. The article concludes that, to promote effective roll out of TETL programmes, public HEIs should support students in acquiring and using related technologies. Furthermore, there is a glaring need for increased financial support towards empowering Zimbabwe's public universities to become more resilient and responsive to the teaching and learning needs of students from different social backgrounds.

Keywords: technology enhanced; teaching and learning; public universities; e-learning, post-COVID-19

Introduction

Education continuously evolves to integrate and adapt to emerging technologies as well as societal needs (Yazici and Özerbaş 2022). Over the past few years, the COVID-19 pandemic has accelerated the use of information communication technologies (ICTs) in higher education institutions (HEIs) (Chigora et al. 2022). Moving forward, post the pandemic, public universities have intensified the integration of ICTs in teaching and learning towards ensuring a seamless transition to online learning. The pandemic therefore stimulated the appetite of most HEIs in coming up with educational innovations to counteract the disruption in HEIs (Chadda and Kaur 2021). Zimbabwe's public universities have committed to embracing TETL for use by staff and students in delivering lecturers online, online libraries and student portals (Babbar and Gupta 2022). However, despite the uptake of ICTs before the pandemic, the COVID-19 environment proved that there were gaps surrounding the integration of TETL into Zimbabwe's public HEIs (Hapanyengwi et al. 2021). Zimbabwe is one of the countries affected by COVID-19, especially the education sector. Public universities either were not fully operational or did not have the capacity to fully support online learning (Hapanyengwi et al. 2021). Institutions either postponed or cancelled all campus events such as examinations, student enrolments and graduation ceremonies during the peak of the pandemic. As Shava (2022) concludes, universities in developing countries were not prepared for this eventuality.

This study evaluates TETL at Zimbabwe's public universities through a case study of two public universities that were selected through random sampling. The two universities are herein referred to as Case University 001 and Case University 002 for ethical reasons. The study was guided by the research objectives and research questions as given below.

Research Objectives

- Identify the teaching and learning technologies currently used in Zimbabwe's public universities and examine how they are being implemented.
- Explore the benefits of TETL in Zimbabwe's public universities.
- Examine the factors militating against effective adoption of TETL at Zimbabwe's public universities.
- Proffer recommendations on how public universities in Zimbabwe can effectively integrate technology in teaching and learning.

Research Questions

- What are the teaching and learning technologies currently used in Zimbabwe's public universities and how are they are being implemented?
- What are the benefits of TETL in Zimbabwe's public universities?
- What factors are militating against effective adoption of TETL in Zimbabwe's public universities?

- How can public universities in Zimbabwe successfully integrate the use of technology in teaching and learning?

Theoretical Framework

The study was underpinned by Delone and Mclean's (1992) information systems success model (ISSM) (figure 1). Scholars such as Straub (2003) contend that the ISSM is the most popular model of information system success measurement and evaluation. In the context of this research, the ISSM was a useful tool in assessing university digital platforms associated with teaching and learning such as learning management systems (LMSs), e-library and student portals. The ISSM provides a comprehensive understanding of information systems success by identifying, describing and explaining the relationships among six of the most critical dimensions of success along which information systems are commonly evaluated. These dimensions are information, system and service quality, usage intentions, system use, user satisfaction and net system benefits.

User satisfaction refers to the extent to which the user is satisfied with the information system. Through interrogating user satisfaction, the ISSM enabled the study to gain insights from students and staff into the challenges militating against effective adoption of TETL in public universities in line with the study's objective three. The net system benefits component of the ISSM assisted with evaluating the benefits of TETL in line with the study's objective two. Information quality points to the quality of data that the system can store, deliver or produce and has an effect on the user's satisfaction with the system. In the context of this study, this dimension was useful in evaluating the opinions of students and staff on the quality of information in digital platforms such as the LMSs, e-library and student portals. System quality on the other hand refers to the capabilities of a system. This dimension was useful in examining the students' perceptions on the quality of the digital platforms that are facilitating teaching and learning at the case universities.

Service quality has a direct impact on the usage intentions and user satisfaction with the system which will in turn have an effect on the net benefits that the system will produce. In this study, the service quality dimension was applied in evaluating what students thought about the service from the digital platforms that facilitate teaching and learning. In addition, the ISSM suggests that system use is assumed to influence a user's satisfaction with the information system which will in turn affect the merits that the system is able to provide. In this study, the dimension of system use was applied in analysing factors that drive both students and staff towards using the digital platforms for teaching and learning.
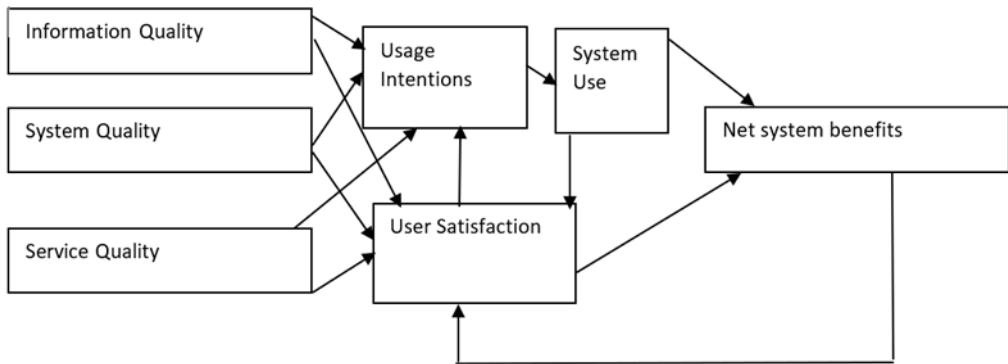
Figure 1: Information systems success model by DeLone and McLean (1992)
Source: Lui (2005)

Literature Review

Technology-enhanced teaching and learning refers to any technology that enhances the learning experience. Under the current wave of TETL, a variety of digital platforms for teaching and learning have been developed to complement traditional teaching methods. Some of the common platforms are Google Classroom, Moodle, Blackboard, Canvas and Sakai (Marinoni et al. 2020). E-learning can be either synchronous or asynchronous. Synchronous learning refers to instructors and students gathering at the same time (virtual or physical space) and interacting in real time, whereas in asynchronous learning, students access materials at their own pace and interact with each other over long periods (Sakala 2019; Zeleza and Okanda 2021).

Ndzinisa and Dlamini (2020) identified some benefits of TETL which include students learning from anywhere at any time, flexibility to students in accessing learning materials and fostering collaboration and interaction through the use of discussion tools. In addition, when lecturers and students interact virtually, they can share material in formats such as videos, audio, podcasts and documents (Marinoni et al. 2020; Sakala 2019). On the other hand, Al-Ataby (2020) contends that universities in developing economies are leveraging artificial intelligence (AI) to enhance their administrative efficiency. Data analytics and AI are increasingly being used to enhance decision-making in Western universities. On the contrary, Shava (2022) avers that HEI's students from developing economies still face unique challenges such as the provision of ICT gadgets, lack of ICT literacy skills, access to internet connectivity and the persistent power outages. This affects effective roll out and implementation of TETL. On the other hand, some universities in the developed world have successfully integrated ICTs in their teaching and learning. During the pandemic, universities across Europe rapidly expanded their use of LMS platforms to facilitate remote learning and ensuring continuity of education despite widespread campus closures (Chigora et al. 2022). As

argued by Enaifoghe and Ndebele (2023), existing technology hardware, software and networking must be self-serving, scalable and dynamic to address the broader digitalisation conceived by the university.

Although there has been research on e-learning in HEIs during and after the pandemic crisis, this study observed and sought to address a contextual gap in literature. There is limited research focusing on TETL at Zimbabwe's public universities. Previous studies refer to HEIs, incorporating both private and public universities, whereas the experiences of public and private universities might not be similar. This study addresses this gap through its focus on Zimbabwe's public universities.

Methodological Approach

The study adopted a qualitative approach under an interpretivist paradigm. Using an exploratory research design, the study was conducted through a descriptive case study of two public universities in Zimbabwe. From the 14 public universities in Zimbabwe, two were selected through simple random sampling. Case University 001 had 26 000 students at the time of the study while Case University 002 had 541 students. This enabled evaluating TETL at a large and well-established university and a smaller, fairly newly established public university. The descriptive case study was considered ideal as it enabled a detailed account of the studied phenomenon which ensured that the research objectives were adequately addressed.

The study purposefully sampled students, and academic, ICT and administrative staff who participated in focus-group discussions (FDGs) and face-to-face in-depth interviews respectively. The participants included only those who interface with the universities digital platforms that support teaching. These include ICT directors, deputy librarians and examinations departments. For academic staff, the study considered only academic departmental chairpersons who were teaching. Therefore, 10 interviews for chairpersons were conducted in Case University 001 while 5 interviews were conducted under Case University 002. To ensure students from all faculties were represented, one FDG was conducted per faculty. A total of 10 FDGs were conducted under Case University 001 while five (5) FDGs were conducted under Case University 002. The FDGs had between eight to 10 participants. The study employed thematic analysis following Creswell and Creswell's (2014) steps of analysing qualitative data. This involved preparing and organising the data, exploring and coding the data, describing findings and forming themes, interpreting the meaning of the findings and ensuring credibility of the findings.

The study addressed potential biases by ensuring credibility and trustworthiness of data through member checking to validate the findings of the study. The study also employed triangulation where data were collected through FDGs and in-depth interviews, which enabled cross verification of the findings during the data collection process.

Ethical Considerations

Ethical clearance was acquired from the Ethics Review Board of the Women's University in Africa. Clearance was sought and obtained from the two public universities. The participants completed informed consent forms and were informed of their right to withdraw from the study. Throughout the study, ethical values of privacy and confidentiality were upheld. To maintain confidentiality, the study made use of pseudonyms and withheld the names of the two case universities.

Findings

Teaching and Learning Technologies Currently Used in Zimbabwe's Public Universities

Learning Management Systems and Student Portals

The study revealed that Zimbabwe's public universities are at varying levels on integration of TETL. Zimbabwe's public universities are mostly making use of LMSs. The common LMSs in use are Moodle and Google Classroom. Case University 001 uses an LMS software that was developed in-house and Case University 002 uses an open-source LMS. The study observed that through the LMSs students register for their classes' online, submit assignments and take online tests mostly in the form of a quiz for continuous assessments. Students also track grading of their continuous assessments on their individual portals. As the findings indicated, there is, however, underutilisation of LMSs on the part of academic staff and students which can be attributed to issues such as lack of user satisfaction as suggested by the ISSM. Teaching and learning activities are mostly limited to posting course outlines and handouts at the expense of using interactive tools such as discussion forums and chat rooms.

A participant from Case University 001 said:

> LMSs facilitate easy and impulsive student friendly service, easy payment facilities, offline learning facilities and course outline management but you find that some categories of staff and students do not have the necessary skills to navigate these platforms.

Additional Technologies

The FDG participants highlighted that lecturers were mostly making use of recorded audio messages on WhatsApp and sending learning material through WhatsApp. Classes were also being convened through video conferencing on Zoom, Skype and Microsoft Teams. As suggested by the ISSM, the study revealed that information quality has an effect on the user's satisfaction with the system and that academic staff make use of platforms which they perceive as useful.

Overhead Projectors and Interactive Whiteboards

The study revealed that public universities have taken strides towards investing in overhead projectors and interactive whiteboards. In both case universities, interactive whiteboards and overhead projectors were in use although they were not in every classroom. Interactive whiteboards enable lecturers to display digital content and use touch-screen technology to manipulate content during lectures. An academic staff member from Case University 002 said;

> Overhead projectors and interactive whiteboards provide an innovative way to share information, facilitate discussions and enhance the overall learning experience. In some of our classrooms interactive whiteboards have replaced traditional whiteboards or flip charts.

Library E-Resources

The study revealed that public university libraries are offering e-resources such as e-journals, e-books, and online catalogues and databases. Students and staff have online access to the institutional libraries in both Case Universities 001 and 002. On the contrary, the scarcity of bandwidth is having a negative impact on students and staff's access to the online resources. As a result, the investments are not being used as efficiently as they should. Two participants from the Case University 002 Library had this to say:

> Due to internet connectivity challenges our online resources are underutilised. Students complain that the system is always down.

> Persistent power outages due to load shedding are affecting students' access to e-resources due to the absence of reliable power back up at our main library.

Antiplagiarism Software and Artificial Intelligence

Public universities have incorporated the use of antiplagiarism software in teaching and learning. Both Case University 001 and 002 were using Turnitin to check for plagiarism in coursework assignments, research projects, dissertations and thesis submitted by students.

Academic staff from both universities highlighted that there is need to rethink assessments as students are leveraging AI for generic answers from the internet. An academic staff member from Case University 001 said:

> The rise of AI is destroying critical thinking and will see more cases of plagiarism in academia. There is need to counter this and ensure academic integrity is upheld through responsible use of AI and effective use of antiplagiarism softwares.

The study also highlighted that, although tools such as Turnitin play a vital role in maintaining academic integrity, their effectiveness is increasingly being put to the test

by the rapid growth of AI-generated content. Academic staff pointed out that traditional similarity-checking tools often struggle to catch advanced AI-assisted writing, especially when students use paraphrasing algorithms or generative AI tools that create text not directly lifted from existing online sources. Consequently, universities are starting to rethink their reliance on plagiarism-detection software alone and are looking into additional strategies such as oral defences, ongoing assessments, and more tailored process-oriented assignments. These methods allow lecturers to evaluate not only the final output but also how students develop their ideas and demonstrate their understanding without leaning on AI tools.

Furthermore, the findings indicate that the rise of AI has brought about new ethical and educational challenges that need immediate attention in public universities. While AI offers opportunities to enhance learning – such as providing instant feedback, enabling personalised study support and assisting with research – many students are not receiving proper guidance on how to use it responsibly and ethically, which can lead to misuse. Academic staff emphasised the importance of having clear institutional policies and training for students on academic integrity in this AI-driven era. Without these frameworks, universities risk creating situations where technological progress outstrips the ethical protections needed to uphold the credibility of academic work. The study ultimately concludes that finding a balance between leveraging the benefits of AI and implementing strong integrity measures – through digital literacy programmes, improved assessment designs and upgraded plagiarism detection technologies – will be essential to preserving the quality and authenticity of higher education in Zimbabwe.

Benefits Presented by Integrating Technology in Teaching and Learning

The findings highlighted that the ability to stay at home is the most commonly observed positive outcome of TETL among students. The participants identified accessibility, flexibility and collaboration as significant benefits of TETL. Academic staff acknowledged that LMSs are an effective tool for content management as they enable centralised storage and organisation of learning materials.

Expansion of Higher Education Institutions Through Open Distance E-learning and Internationalisation

The findings revealed that TETL provides the opportunity to reach and cater for a large number of students in various locations especially through open distance e-learning (ODeL. Zimbabwe's public universities are leveraging on TETL to promote their expansion though ODeL and internationalisation. Case University 001 has regional and international students enrolled under ODeL.

Challenges Militating Against Effective Implementation of Technology-Enhanced Teaching and Learning

The findings indicated that TETL is being affected by challenges associated with access to internet connectivity on the part of students and staff, the high costs of bandwidth,

lack of ICT devices on the part of students and staff, lack of digital skills and reliable power backup in public universities. The participants from the IT departments of both case universities bemoaned poor ICT infrastructure and high student:computer ratios. Two participants stated:

> The major challenge is the provision of ICT gadgets for students. Some of our students lack literacy skills. Also a number of students living with disabilities are not adequately catered for due lack of the necessary assistive technologies.

> Some academics lack sufficient knowledge of information technology and their understanding of online teaching is relatively poor". Bandwidth is expensive and our ICT infrastructure is obsolete.

The study revealed that internet service providers in Zimbabwe are facing operational challenges such as frequent power outages, high fuel costs for backup generators and expensive maintenance of network equipment. These operational expenses add to the overall cost of providing internet services which are ultimately borne by consumers.

Discussion of Findings

The study established that public universities in Zimbabwe have increasingly embraced the incorporation of ICTs in their teaching and learning pedagogies. Perhaps most indicative of this trend has been the adoption of LMSs and other digital teaching tools which now form part of the instructional environment in many institutions. Despite this, the scale of TETL across the country's HEIs remains comparatively slow. However, where implemented, TETL has already begun to revolutionise the delivery of teaching, consequently contributing to improved academic achievement and the further internationalisation of Zimbabwe's public universities. TETL is one of those pedagogical innovations that allow students to access learning materials wherever they are in the country and at whatever time, while allowing for virtual interactions between lecturers and students. According to a study, TETL increases accessibility because it minimises a number of barriers, including those of time, distance and physical infrastructure.

However, a number of structural and socio-economic barriers have continued to hinder the complete realisation of TETL. It has been observed that students' and staff's socio-economic backgrounds determine their ability to access ICT devices and reliable internet connectivity, which in turn influence effective engagement with e-learning platforms. This often leads to situations where students from poor backgrounds are unable to actively engage in online learning because of limited access to laptops, smartphones or data services. The current study also established that the successful implementation of ICT-driven education is highly dependent on the availability of appropriate ICT infrastructure. In Zimbabwe's public universities, this remains an unresolved challenge. TETL initiatives at these universities are currently being hampered by a shortage of functional ICT infrastructure, high bandwidth costs, unstable

internet connectivity, frequent power cuts and limited investment in digital resources. Indeed, Hapanyengwi et al. (2021) noted these systemic barriers as ongoing obstacles to equalising TETL opportunities throughout the country.

The study confirmed that generational differences in the digital exposure of users ensure that satisfaction with, and intentions to use, ICT platforms vary significantly, in line with the ISSM. Younger, digitally native students are more likely to adopt e-learning tools, while some staff and older learners face challenges owing to limited prior exposure to ICTs. The paucity of bandwidth was identified as a very disruptive influencer that, for example, impedes access to online library resources and ensures that many e-resources, which should support teaching, learning and research, are not used. This, of course, reduces overall effectiveness of digital learning initiatives and diminishes the possible benefits of TETL both for academic staff and students.

Aside from these infrastructural and socio-economic barriers, the study also brought to light key institutional and pedagogical issues that determine the success of TETL initiatives. The effectiveness of integrating ICT is not only a matter of making these digital tools available but also of developing the capacity of academic staff to integrate them meaningfully into their teaching. For instance, most lecturers need continuous professional development to enhance their own digital literacy, while a need exists to adapt curriculum materials for online delivery and to design interactive student-centred learning experiences. Unless such training is provided in a structured way-with accompanying incentives from the institution-there is a real danger that the ICT tools will be used superficially and will therefore have limited pedagogical effectiveness. The study therefore highlights the importance for universities to develop comprehensive digital transformation plans that include staff training, curriculum redesign and ongoing technical support. By developing internal capacity and aligning use of ICT with pedagogic aims, public universities in Zimbabwe will increase the quality and sustainability of TETL adoption and thereby enhance student engagement and learning outcomes.

Given the foregoing challenges, this study finds that there is an immediate need for increased government support to enhance digitalisation initiatives in public universities in Zimbabwe. These initiatives include investment in ICT infrastructure, subsidisation of bandwidth costs, enhancement of power backup systems, and ensuring that students from all walks of life have access to devices that would enable them to meaningfully engage with the digital learning environment. Increasing institutional capacity on such aspects would not only contribute to the successful integration of TETL but also help to advance equal access to higher education, enabling Zimbabwe's public universities to stay abreast with global trends in digital pedagogy.

Limitations

Typically, all studies are prone to limitations. This study was conducted through a case study of two out of the 14 public universities in Zimbabwe. However, the findings of

this study provide a basis for broader research in Zimbabwe's public HEIs on the implementation of TETL in public universities.

Conclusions and Recommendations

The study concludes that, although public universities in Zimbabwe have taken strides towards integrating technology in teaching and learning, this has been met with challenges. As the study revealed, learners from disadvantaged backgrounds struggle to access ICT gadgets and internet connectivity which are essential for them to access quality e-learning experiences. In addition, the study concludes that the availability of ICT hardware and software that TETL thrives on also contributes towards system quality.

The study recommends allocating more funding towards ICT infrastructure to promote TETL in Zimbabwe's public universities. To promote effective roll out of TETL programmes, public universities should support students in the acquisition and use of related technologies. Without government's support, TETL may remain a preserve for students from high income households. Furthermore, the study recommends partnerships between public universities for sharing joint technology and software development, and connectivity among other aspects. There is a need for continuous mandatory ICT training for academic staff with a special focus on teaching and learning pedagogies. Such training will equip staff with the necessary skills and knowledge regarding the use of technology in teaching and learning.

This study contributes to the growing body of knowledge on TETL through citing case studies of Zimbabwe's public universities, an area where the researchers observed a gap in literature.

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