The Adoption of Learning Management Systems by Private Schools during the Covid-19 Pandemic in Limpopo Province of South Africa

BY

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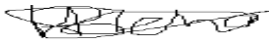
DECLARATION

I, Beaular Lilian Ticharwa hereby declare that this project for the Master of Commerce degree in Business Information Systems submitted to the Department of Business Information Systems at the University of Venda has not been submitted previously for any degree at this or another university. It is original in design and in execution, and all reference material contained therein has been duly acknowledged.

Student:  **Date: 07/09/2023**

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ABSTRACT

Learning Management Systems (LMS) are becoming essential to the educational process. The continuous adoption and usage of LMS addresses multiple flaws of the traditional education system. LMS became a crucial part of any educational process during the 2020 Coronavirus pandemic, as the circumstances made it unsafe to continue with the formal face-to-face educational process. The purpose of the study was to investigate the adoption of learning management systems by private schools during the Covid-19 pandemic in the Limpopo Province of South Africa to come up with an LMS framework that the schools could use to guide the adoption and usage of e-learning during abnormal times such as COVID-19 pandemic. This study adopted a mixed methods research methodology and utilized a cross-sectional survey and case study research designs. The study population included teachers and learners in Limpopo Province private schools. Probability and non-probability sampling methods were employed through cluster and purposive sampling techniques to arrive at the study sample. Survey questionnaires were used to collect quantitative data, while structured interviews were used to collect interview data. Quantitative data were analysed using both descriptive and inferential statistics. The descriptive statistics included frequency distributions, mean, and measures of dispersion, while the inferential statistics used the ANOVA, multiple regression analysis, Pearson correlation coefficient, and F-test. This was computed with STATA version 16. Qualitative data were subjected to thematic analysis. Both quantitative and qualitative results were converged to obtain a comprehensive assessment. The study found that ICT infrastructure availability and positive organizational and environmental factors are significantly related to LMS adoption. The challenges to LMS adoption include students' lack of e-learning skills, negative attitudes, teacher unpreparedness, and inequalities among learners and educators. These results indicate that for schools to adopt LMS effectively, they should consider the needs of their institutions, choose user-friendly platforms, ensure that LMS are scalable, provide technical support, encourage engagement, and regularly monitor system usage and performance. The study's limitations were not addressing the long-term effects of LMS use on education or the comparative effectiveness of different LMS. This could also provide a valuable foundation for longitudinal studies tracking the effects of LMS adoption over time.

Keywords: Learning management systems, adoption, COVID-19 pandemic, private schools, Limpopo Provine, South Africa

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1 CHAPTER ONE: INTRODUCTION AND BACKGROUND

1.1 Introduction

A Learning Management System (LMS) is a software application that aids in administering, documenting, tracking, reporting, and delivering educational courses or training programs (Gautreau, 2011). Alias and Zainuddin (2005), define an LMS as a software application or web-based technology used to plan, implement, and assess a specific learning process. Sanga (2016, p 11), notes that "Internet-based learning management systems (LMSs) such as Moodle, D6 Communicator, Edu Pac, Google Classroom, Seesaw, WhatsApp, Facebook, and Telegram are some of the popular internet technologies that support distance, face-to-face, and hybrid/blended teaching-learning processes". Since most systems are web-based, learning materials are available 24/7 (Black, *et al*., 2007). With the outbreak of the Coronavirus pandemic in 2019 (COVID-19), LMSs become the most common and widely used tools in South African schools. According to Torrisi-Steele and Drew, (2013), LMSs not only form the foundation of distance or remote education but are also used heavily to complement the traditional face-to-face teaching at schools in a blended learning setting. Online tutoring is on the rise due to COVID-19-induced lockdowns requiring teachers to be extensively oriented on the platforms. Many schools and teachers are not motivated to teach their classes using LMS for many reasons (Gautreau, 2011). Many of them lack the experience of teaching online and are now scrambling to figure out how to make remote classes work for their courses (Read, 2020).

Furthermore, Ahluwalia (2020) asserts that e-learning has become the necessary norm; many teachers find it challenging to conduct distance learning without proper guidelines. Ariff, (2020), argues that schools and universities are closing their campuses, many indefinitely, and abruptly forced to transfer their learning online using free services such as Google Classrooms and Zoom and burdening their students with heavy assignments loads, with questionable results. In Indonesia, the rapid spread of COVID-19 forced governments to close schools and enforce at-home distance learning (Azzahra, 2020). Various initiatives are underway to ensure study activities continue despite the absence of face-to-face schooling. LMS applications enable students and teachers to benefit from today's technology in their teaching and learning processes. Hence, this study seeks to identify and understand the factors that affect the adoption of LMS, which is important for future LMS design and educational strategy development and management.

1.2 Background to Study

In the 1990s, e-learning (LMS), which is, learning facilitated online through network technologies emerged across South Africa (Ravjee, 2007). In the context of South Africa, LMS adoption brought about new vocabulary, policies and structures, and budgets. In the wake of COVID-19, in South Africa, there were continuous lockdowns and restrictions from mid-March 2020 that disrupted the normal school calendar leading to numerous school-closures. This made LMS indisputably an essential tool for pedagogy. LMS became a crucial part of any educational process in South Africa during the pandemic, as the circumstances made it unsafe to continue with the traditional face-to-face, in-school educational process. Conceptually, remote online learning and teaching are synonymous with distance learning, distributed learning, blended learning, and mobile learning (Hodges *et al*., 2020). However, simply taking the materials and module content meant for the contact teaching method and uploading or sharing them via electronic methods does not necessarily equate to online learning and teaching (Zimmerman, 2020). Online learning and teaching connote a computer-based distance education delivery model which provides flexibility in teaching and learning in multiple environments and times (Czerniewicz, 2020).

Furthermore, online learning provides learners with a virtual interface to share information, read and review instructional materials, undertake tests, and do assignments in their own spaces. Despite this flexibility, concerns about its implementation remain a bone of contention during the coronavirus crisis. The uncertainty of resuming a normal life due to the coronavirus pandemic has been a thorny issue. To ensure that learning continues, colleges and universities as guided by the ministries of education have been seeking the best ways to keep students engaged academically (Zimmerman, 2020). Since COVID-19 is an infectious disease that spreads from one person to another (WHO, 2020), the need to keep students and staff safe was primary. Therefore, most institutions in Africa, as in other continents opted to cancel all face-to-face classes (Hodges *et al*., 2020). This disrupted traditional classroom teaching and learning in African institutions, which primarily depend on face-to-face pedagogy (Czerniewicz, 2020). Consequently, alternatives had to be sought for a continuous learning and teaching process. This culminated in the emergency remote online teaching and learning witnessed in many institutions currently.

Public schools in impoverished communities of South Africa frequently lack sufficient resources (Jantjies, 2020). Moreover, there have been instances of burglaries and robberies specifically targeting electronics, which in turn hinders learners' ability to access them (Jantjies, 2020). Therefore,

it is necessary to examine and assess the difficulties associated with technology in educational institutions. By comprehending the obstacles, one can enhance the rate of acceptance by directly tackling them. Private schools typically enjoy superior access to resources compared to public schools. Due to their financial stability, they have the opportunity to invest in digital infrastructure, such as LMS systems (Choi, 2016). However, for online teaching to become mainstream, institutions must ensure that their teachers have appropriate skills and expertise in not only the delivery of online courses and programs but also their design and development. A substantial proportion of the literature describing online learning provides evidence of a lack of teacher readiness for large-scale moves to online learning. Examples include teaching online, using technology in teaching, technology currency, and teacher training. According to Albrahim (2020), online teaching competencies and talents must be determined to help format expert improvement packages for online instructors. These capabilities and competencies are classified into six categories, namely, (a) pedagogical skills, (b) content skills, (c) plan skills, (d) technological skills, (e) management and institutional skills, and (f) social and conversation skills. Online colleges can use these sets of competencies to evaluate their capabilities to educate online and pick out their educational needs. Thus, it becomes apparent that proper research on the adoption and usability of LMS be done earlier before any successful implementation. It is from this background, that the researcher seeks to investigate the adoption of LMSs in private schools during the COVID-19 pandemic context in the Limpopo Province of South Africa.

1.3 Research Problem

COVID-19 has brought untold disruptions and challenges to our daily lives (Zimmerman, 2020). Businesses and the education sector were not spared, with disruptions felt across the world. This called for schools (both private and public) to think outside the box and become innovative in their pedagogy. Thus, the adoption of LMSs became a critical tool for successful teaching and learning during COVID-19 pandemic lockdowns. Although there are many LMSs on the market with many features which were developed for both primary and secondary schools, the success of those systems is highly dependent on their widespread adoption by schools. Since the schools were forced by the Covid-19 pandemic to abruptly adopt LMS, numerous challenges were inevitably experienced by all stakeholders, school teams, educators, learners, and parents who had no option but to become home tutors for their children.

To date, limited research has been conducted to investigate the adoption of LMSs by private schools during the covid-19 pandemic in South Africa (Burtsev, 2020, Gamende et al. 2022). Furthermore, it is worth noting that many previous studies investigating the adoption of learning management systems in the context of South Africa focused on their general adoption and were limited in number or scope. This study therefore investigates the adoption of LMS by private schools in the Limpopo Province of South Africa during the COVID-19 pandemic lockdowns and proposes a framework that could guide and assist schools to successfully adopt LMS with minimal hustles into their pedagogy.

1.4 Aim of the study

This study investigates the adoption of learning management systems by private schools during the Covid-19 pandemic in the Limpopo Province of South Africa to come up with a LMS framework that could be used by the schools and other stakeholders to guide the adoption and usage of e-learning during abnormal times (when the normal pedagogy is severely challenged and disrupted) like during the covid-19 pandemic.

1.5 Research Objectives

The following are the research objectives guiding this study:

1. To assess the influence of ICT infrastructure, and organisational and environmental factors on the adoption of LMSs by private schools in Limpopo Province during the COVID-19 pandemic.
2. To evaluate challenges being faced by schools when adopting and using LMS during the covid-19 pandemic from a managerial perspective.
3. To establish mechanisms being taken by schools to address factors affecting learners' and teachers' capacity to adopt LMS.
4. To suggest measures that can be implemented to facilitate the effective adoption of LMS by private schools in South Africa.

1.6 Research Questions

The following are the research questions addressed in this study:

1. What is the influence of ICT infrastructure, and organisational and environmental factors on the adoption of LMSs by private schools in Limpopo Province during the COVID-19 pandemic?

2. What challenges are faced in adopting and using LMS by schools during the covid-19 pandemic from a managerial perspective?
3. How are schools dealing with factors that are affecting learners' and Teachers' capacity to adopt LMS?
4. What measures can be implemented to facilitate the adoption of LMS by private schools in South Africa?

1.7 Significance of the Study

This research contributes new insights to the existing body of knowledge in the field of e-learning through the development of a framework for establishing best practices in the adoption of LMS during crisis times such as the COVID-19 pandemic. It assesses the adoption of LMS in private schools and uses the Limpopo province e-learning experience to propose the way forward, as the schools countrywide consider introducing the system fully. This in-depth investigation of the adoption and usage of LMSs is essential to improve the usage of these systems to their full potential.

With the advent of Covid-19, these LMSs have become popular across the whole world and in some instances, they have completely replaced face-to-face teaching and learning. Therefore, the question is no longer whether the LMSs are suitable for teaching and learning, but rather, how can we improve them to overcome their limitations so that they become a comprehensive alternative to face-to-face learning? Thus, this study delivers insight to those stakeholders responsible for planning, developing, and implementing LMSs at private schools. Also, the results of this research will contribute to the knowledge base, as there is not much literature published in the Limpopo Province of South Africa concerning LMS programs. The results can be generalised to other private schools worldwide.

1.8 Key Concepts in the Study

1. ***Adoption:*** "The decision to make full use of an innovation as the best course of action available" (Rogers, 2003, p. 21).
2. ***Blended Learning:*** It represents an opportunity to integrate the innovative and technological advances offered by online learning with the interaction and participation offered in the best traditional learning (Thorne, 2003, p.5).
3. ***COVID*-19:** Coronavirus disease is an infectious disease caused by the SARS CoV-2 virus. The novel Coronavirus is a new strain that started in 2019 and has not been previously identified in humans.

4. **E-*assessment*:** Electronic tools that support formative assessment (Daly, *et al*., 2010).
5. ***Engagement***: Engagement occurs by students when activities are meaningful, and students are actively involved with the acquisition of knowledge (Alrushiedat and Olfman, 2013; Delialioglu, 2012).
6. ***Formative Assessment***: An activity that centres on a learner or group of learners who provide information and receive feedback allowing for the modifications of teaching and learning by both the learner and the instructor (Daly *et al*., 2010).
7. ***Information and Communication Technologies (ICT):*** The application of computers and communication networks including the Internet (Webb, *et al*., 2013).
8. ***Innovation***: "An innovation is an idea, practice, or project that is perceived as new by an individual or other unit of adoption" (Rogers, 2003, p. 12).
9. ***Learning Management System:*** "Internet-based learning management systems (LMSs) such as Blackboard, Moodle, WebCT, Canvas, Scholar, and Desire2Learn are some of the popular internet technologies that support distance, face-to-face, and hybrid/blended teaching and learning processes" (Sanga, 2016, p. 11).
10. ***Lockdown***: In this context, it is a restriction policy for people or communities to stay where they are, usually due to specific risks to themselves or others if they move and interact freely.
11. ***Technology Integration***: The concept of merging face-to-face lectures with online technologies to produce learning through a variety of approaches (Al-Ani, 2013).
12. ***Web 2.0***: Technologies that encourage learners to creatively design, collaborate, and share their learning (Tu *et al*., 2012). Web 2.0 includes social networks, creative works like podcasts or videocasts, blogs, and the expansion of knowledge through wikis or web pages (Greenhow *et al*., 2009)

1.9 Structure of the Dissertation

The dissertation is divided into five chapters. **Chapter One** gives the general background and problem statement, the objectives, the significance of the study, the scope and limitations of the study and the chapter synthesis of the research. **Chapter two** presents the literature review, and analyses relevant theoretical frameworks and models, leading to the proposal of the conceptual framework for the study. **Chapter three** presents a detailed description of the research methodology which was used. **Chapter four** presents the findings and the data analysis. Finally, **Chapter five** concludes the

study, outlines its limitations and makes recommendations for future research direction. The outline is summarized in Figure 1.1:

Figure 1-1: Thesis Outline (Source: Author's Elaboration)

1.10 Chapter Summary

This study is significant in these trying times when educational institutions continue to search for a solution to put education forward in the COVID-19 period, countering lost time during lockdowns. An assessment of the adoption and usage of LMS to blend learning in private schools of Limpopo Province is the initial step towards the attainment of such a sustainable solution to the education system. The study of Tamban and Maningas (2020) demonstrated the practical use of enhancement programs driven by evidence to improve overall teacher capacity. This present assessment study is also desired to provide a baseline support structure to assist teachers in an efficient transition to an LMS approach. Thus, this study aims to comprehensively assess the usage of LMSs as a response to the impact of COVID-19 on the modalities of instructional implementation.

2 CHAPTER TWO: LITERATURE REVIEW AND THEORECTICAL FRAMEWORK

2.1 Introduction

This chapter outlines the theoretical framework used to guide this study and presents the concepts of LMS. It discusses its benefits and constraints concerning LMSs. The review also explores case studies in other areas and locally. And finally, it gives a conclusion to the literature review.

2.2 LMS Definition

The learning Management System (LMS) is one of the innovations that can be developed to facilitate the less-than-optimal implementation of learning (Elfeky *et al*., 2020; Sayıner and Ergönül, 2021; Zarzour *et al*., 2020). LMS is a software unit that is comprehensively integrated into various features for course delivery and management. LMS automatically manages course catalogue features, course material delivery and quizzes (Sakova and Chevereva, 2021; Zabolotniaia *et al*., 2020). Learning Management System (LMS) or Course Management System (CMS), also known as Virtual Learning Environment (VLE) is a software application used by educators, both universities/colleges and schools as internet-based online learning media (Washington, 2019; Bervell et al., 2020). The LMS allows educators and students to access it anytime and anywhere and through any device such as a PC, Tablet, or smartphone (Bervell and Arkorful, 2020; Bradley, 2020). In general, LMS has features that must be fulfilled to facilitate the online learning process. These features include an attractive interface; customization to adjust the system according to the user's wishes; virtual class; connection with social media; communication features such as forums and chat; courses or courses; and reports (Stockless, 2018; Mershad and Wakim, 2018). Several previous studies seem to have proven that e-learning-based learning can facilitate students in the learning process, as well as provide convenience for students in accessing subject matter. E-learning will allow for asynchronous interactions, anytime, anywhere, to assist in teamwork and contribute to the use of new technologies in education (Baragash and Al-Samarraie, 2018; Tere *et al*., 2020). Thus, LMSs are an innovation needed to facilitate students' learning during the COVID-19 pandemic.

2.3 Overview of the Education Systems and Adoption of LMS in South Africa

The implementation of educational technology aims to optimise the process of teaching and learning. Despite being introduced three decades ago, the implementation of technology in schools has encountered several obstacles (Mirzajani et al. 2016). Academic scholars have endeavoured to identify the variables that influence the acceptability and implementation of technology. The South

African education setting has extensively deliberated on the adoption, acceptability, and integration of Information and Communication Technology (ICT) at various levels and platforms (Ostrowick, 2018; Parliamentary Monitoring Group, 2016; South African Government, 2016). Multiple research studies indicate that employee involvement and effective change management necessitate the adoption, acceptance, and integration of technology (Macharia & Pelser, 2014; Tabuni & Kusuma, 2019). Literature indicates that the outcome of an invention, whether it succeeds or fails, is determined by the extent to which consumers embrace and accept it. This, in turn, is influenced by various crucial factors and perspectives. The most effective way to comprehend these problems is by utilising theories and models of adoption and acceptance, such as design (Kildea et al., 2019).

The integration of technology in education has had a significant impact on the teaching and learning process (Martin et al., 2011). Additionally, the increasing skills and knowledge requirements have also contributed to changes in this process (Ottenbreit-Leftwich et al. 2018). It is important to gain a deeper understanding of the technologically proficient learners of the next generation Z (Gen Z). Kim and Jensen (2020) argue that as individuals who grew up in the digital age, they utilise technology to acquire knowledge, engage in academic pursuits, and cultivate the essential abilities needed for their daily social, academic, and professional activities. More and more educational institutions are incorporating e-learning into their teaching methods (Manny-Ikan, Dagan, Tikochinski, & Zorman, 2011). Additionally, numerous new advancements have been made to improve the teaching and learning experience (Kim & Jensen, 2020). The emergence of COVID-19 has expedited the use of e-learning in numerous schools across the globe. Research has additionally demonstrated that the utilisation of technology in education has stimulated and improved learner involvement. According to Martin et al. (2011), the introduction of new mobile technology devices has a substantial positive impact on learner engagement and participation in both indoor and outdoor activities.

The South African government has implemented many technology initiatives and programmes to provide schools with the necessary resources and to train teachers and students for a learning environment that incorporates technology (South African Government, 2016). These endeavours strive to provide learners with the necessary skills for the digital workforce. Several initiatives have aimed to provide technology infrastructure, content, and relevant skills to assist in teaching and learning in schools, as well as decision-making processes (Ostrowick, 2018). Recent reports indicate that several provinces and districts have initiated projects aimed at developing an electronic portal

for educators and learners. Additionally, some have implemented data-driven decision-support systems to improve their decision-making processes. Nevertheless, these advancements have not been fully embraced by educators and learners, mostly due to a multitude of issues encompassing socio-economic and user-related obstacles. Multiple studies highlight the importance of implementing comprehensive co-design technology strategies (Chemisto, Rivett, & Jacobs, 20163) and the corresponding adoption procedures, along with providing adequate training before the implementation of new technologies (Suárez-Rodrígue et al. 2018). This is not efficiently adhered to while implementing new technologies in public schools.

Empirical research also demonstrates that the introduction of any type of technology in schools is met with resistance and is not readily embraced. Resistance and problems frequently arise when technologies are introduced and used in education (Edmunds, Thorpe, & Conole, 2012; Mirzajani et al., 2016). Technology significantly influences the process of teaching and learning. Research on the adoption of technology by teachers has revealed that not all teachers are adequately equipped to utilise technology. This is often due to a lack of training, especially in schools that are underprivileged or located in rural areas (Christensen & Knezek, 2017; Jantjies & Joy, 2017). Public schools in impoverished locations in South Africa frequently lack adequate resources. Moreover, there have been instances of burglaries and robberies specifically targeting electronics, which in turn hinders learners' ability to access them. Therefore, it is necessary to examine and assess the difficulties associated with technology in educational institutions. Gaining insight into obstacles can be utilised to enhance the acceptance of something by directly confronting such obstacles.

Jantjies and Joy (2016) found that the absence of technology education for educators has hindered their ability to fully utilise technology to accomplish educational goals. This additionally impacts their perspective on the utilisation of technology in schooling. Integrating technology in most schools in South Africa is difficult due to a lack of teacher knowledge, as noted by Chigona et al. (2010) and Cantrell and Visser (2011). Nevertheless, it is hypothesised that this obstacle can be surmounted by employing adequate instruction (Bladergroen et al., 2012; Cantrell & Visser, 2011; Chigona et al., 2010).

Research has demonstrated that the impact of perceptions on the adoption of technology is significant and should not be disregarded (Ko, Pei, & Tsai, 2016; Lai, 2017; Scherer & Teo, 2019). Various models and theories have been developed to explain the process of technology adoption. These

models include constructs related to expectancies and perceptions, among others (Lai, 2017; Marangunić & Granić, 2015; Sohn & Kwon, 2020). In their study, Joo et al (2016) conducted a comparison between students' objective utilisation of technology and their subjective assessments of its usefulness and expectations. According to Joo et al. (2016), a study discovered that the perceived utility of mobile learning has a positive impact on its continuing use or adoption. To enhance the acceptance and utilisation of technology, it is crucial to investigate and comprehend the consumers' expectations and views regarding different facets of the technology.

2.4 Benefits of LMS

Several studies note that the benefits of using LMS in learning may include the ability to add insight and help students' understanding (Dhika *et al*., 2019; Akhmalia *et al*., 2018). In addition, learning with LMS is very efficient and flexible because it can be accessed from anywhere anytime if there is an internet connection (Wu and Plakhtii, 2021). This allows students not to miss lessons because they can review the lesson at any time and can provide good learning insight to students. After all, it allows getting more information by looking for additional lessons through an internet search (Ali and Maksum, 2020; Zabolotniaia *et al*., 2020).

2.5 Challenges in the Adoption and Usage of LMSs

COVID-19 has disrupted the conventional learning methods of academic institutions around the world, both in schools and colleges. Although online learning through LMSs has proven to help maintain students' and faculty's health amid the COVID-19 pandemic, it is not as effective as conventional learning (Adnan, and Anwar, 2020). This is due to several challenges that online education is prone to. Previous research found five significant barriers to online pedagogy poor infrastructure; financial constraints; inadequate support; lack of e-learning knowledge and teachers' resistance to change (Kisanga and Ireson, 2015). Famularsih (2020), asserts that in this pandemic situation, not all students have a good internet connection because some of them live in slow-speed internet connection areas. Also, Aguilera-Hermida (2020) found that some students did not have access to technological tools and/or their family conditions limited their accessibility. In the same vein, he mentions challenges in online education such as the lack of online teaching skills in educators, online preparation of lesson plans as it is time-consuming, lack of appropriate support from the technical teams, and traffic overload in online educational platforms. In addition, both students and teachers face challenges due to their deficiency in proper learning attitude, lack of suitable materials for learning, more involvement in classroom learning, lack of self-discipline, and

unsuitable learning environment in some of their homes during self-isolation (Brazendale, *et al*., 2017).

Aguilera-Hermida (2020) suggested that content is essential, but students may have a negative experience again without the proper conditions, and their cognitive engagement can drop. An online course requires detailed lesson plans to design good study materials. Mishra *et al*., (2020), point out that there are several LMSs available for online education but sometimes they create a lot of difficulties. These difficulties are associated with modern technology ranging from downloading errors, issues with installation, login problems, problems with audio and video, and so on. A study by Parkes *et al*., (2014), found that sometimes students find online teaching to be boring and unengaging. Personal attention is also a huge issue facing online learning. Students want two-way interaction which sometimes gets difficult to implement. The learning process may not reach its full potential until students practice what they learn.

2.6 Measures that address factors affecting LMS adoption and Usage

Daniel (2020) notes that the expansion of online learning in tertiary education will further accelerate, and schools will organize themselves more systematically to pursue the aspects of technology-based learning that they have found most useful. Based on the research, Mishra *et al*., (2020), argue that government must ensure the availability of reliable communication tools and high-quality digital academic experiences. There is also a need to promote technology-based learning for students to bridge the gap in the education system before and after the COVID-19 disaster which is also inevitable for uninterrupted learning. Steps that can be taken involve developing a curriculum that reflects the changes seen in content knowledge and student learning experience and enables them to think critically (Daniel, 2020). Responsible institutions need to stand ready to support teachers and learners to have remarkable success for LMSs in the future (Major, 2020). As Purvis, *et al*., (2020) point out, these barriers tend to be stronger and can only be challenged effectively by a clear institutional framework to support and develop (incomplete sentence). Daniel (2020) suggested that asynchronous working gives teachers flexibility in preparing learning materials and enables students to juggle home and study demands. According to Rapanta *et al*., (2020), for education around the world to be more competitive, evidence of faculty readiness in terms of professionalism is required. Online teaching is an important part of such professional readiness but not the only one. Colleges should invest in the professional development of teachers in their faculties to keep them updated on effective pedagogical methods with or without the use of online technology (Rapanta *et al*., 2020).

2.7 Theoretical Underpinnings

LMS applications are novel ICTs and innovations and the intention to use these technologies is considered in technology acceptance and technology adoption literature (Venkatesh *et al*., 2012). This study will be guided by two prominent theoretical frameworks, namely, the Technology Acceptance Model (TAM) and The DeLone and McLean Model of Information System Success.

The acceptance of LMS by teachers plays a significant role in the optimal utilization of these e-learning systems in the education fraternity of South Africa (Buabeng-Andoh, 2012). When teachers have a positive perspective toward the use of LMS and find features of the system to be beneficial, easy, and less challenging to use, there is a high likelihood of its successful adoption and implementation for teaching and learning in schools (Al-Busaidi and Al-Shihi, 2010).

2.7.1 Technology Acceptance Model (TAM)

One of the famous models related to technology acceptance and use is the technology acceptance model (TAM), originally proposed by Davis in 1986. TAM has proven to be a theoretical model for explaining and predicting user behaviour of information technology (Legris, Ingham, and Collerette, 2003). Davis, (1989) proposed TAM to explain why a user accepts or rejects information technology. According to ŠUmak, *et al*., (2011), TAM provides a theoretical framework to explain user acceptance of information technology products and systems. When users are presented with new technology, several factors affect their decisions about how and when they will use the new technology (ibid).

TAM offers a basis on which to show how external variables influence belief, attitude, and intention to use. Two cognitive beliefs are posited by TAM, namely, perceived usefulness and perceived ease of use. According to TAM, one's actual use of a technology system is influenced directly or indirectly by the user's behavioural intentions, attitude, perceived usefulness of the system, and perceived ease of use of the system. Davis, (1985) suggested that users' motivation can be explained by three factors, namely, "Perceived Ease of Use, Perceived Usefulness, and Attitude towards using the System*"*. He hypothesized that the attitude of a user toward a system was a major determinant of whether the user would use or reject the system. The attitude of the user, in turn, was influenced by two major beliefs, namely, perceived usefulness and perceived ease of use, with perceived ease of use having a direct influence on perceived usefulness. Finally, both these beliefs were hypothesized to be directly influenced by the system design characteristics. Figure 2.1 shows the TAM model.

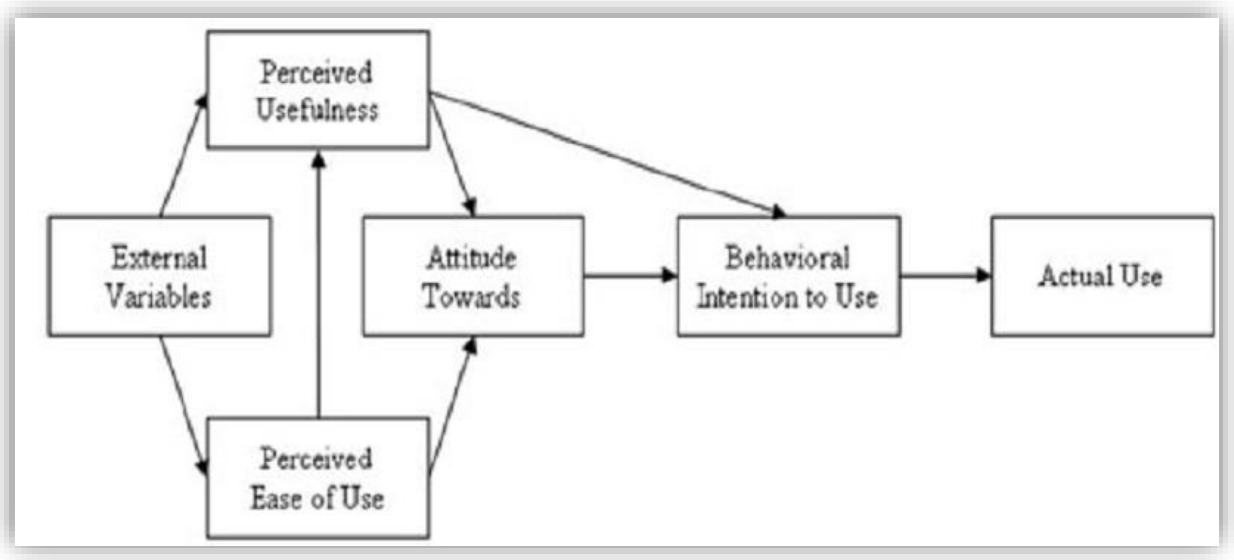

Figure 2-1: TAM Model (Source: Davis, 1985)

2.7.2 The DeLone and McLean Model of Information System Success

Effective measurement of information system (IS) success is a significant issue for both practitioners and researchers. The measurement of success is critical to appreciating the value of IS management actions and IS investments (DeLone and McLean, cited by Hellesten and Markova, 2009). Since, DeLone and McLean (D&M) developed their model of IS success, initially in 1992 and a decade later in 2003, there has been considerable research on the topic of success as well as extensions and tests of their model (Petter, S *et al*., 2008).

According to Hellesten and Markova (2009), to organize diverse research and present a more integrated view of the concept of IS success, DeLone and McLean introduced a comprehensive, multidimensional model of IS success. They categorized IS success into six major dimensions which are system quality, information quality, use, user satisfaction, individual impact, and organizational impact.

Figure 2.2 shows the six interrelated dimensions of success. System quality and information quality jointly affect both use and user satisfaction. Additionally, the amount of use can have a positive or negative effect on the degree of user satisfaction and vice versa. Use and user satisfaction are direct experiences of individual impact, and this impact should eventually have some organizational impact.

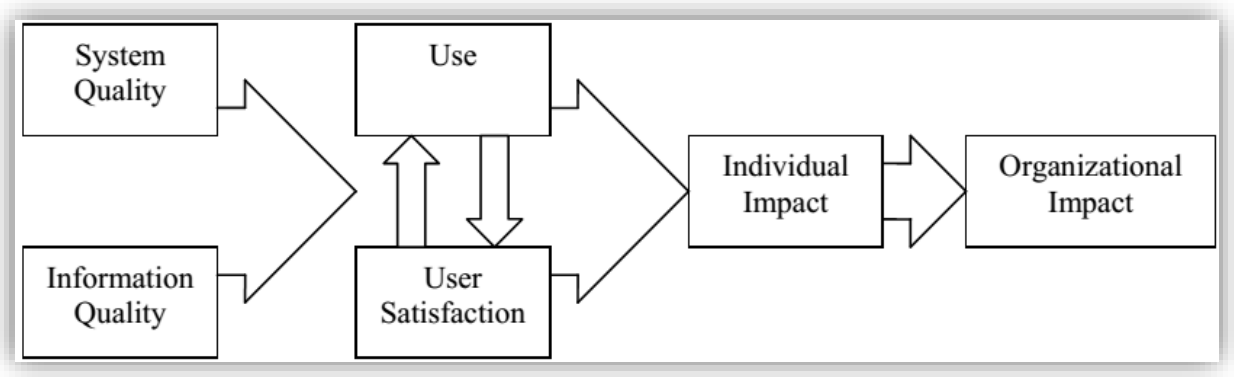

Figure 2-2: The DeLone and McLean Model of Information System Success (Source: Petter, S et al: 2008).

In DeLone and McLean's IS success model, these six dimensions are examined at three different levels, the technical level, semantic level, and effectiveness or influence level. The first dimension of the model, systems quality, studies success at a technical level. It emphasises the desired characteristics of the information system itself which produces the information. The second dimension, which is information quality focuses on the information product instead, and characteristics at the semantic level. At the influence level, use and user satisfaction are measured to analyse the interaction of the information product with its recipients. Furthermore, the influences which the information product has on management decisions (Individual Impact) and organizational performance (organizational impact) are measured at the influence level (Hellesten and Markova, 2009). Some examples of success measures of the six dimensions are presented below in Tables 2.1 to 2.3:

Table 2-1: Examples of Success Measures – Systems Quality and Information Quality

System Quality	Information Quality
Ease of use	**Importance**
Ease of learning	**Relevance**
Convenience of access	**Usefulness**
Realization of user requirements	**Timeliness**
Usefulness of system	**Readability**

Data and system accuracy	**Content**

Source: ***Hellesten and Markova: 2009***

Table 2-2: Examples of Success Measures – User Information and User Satisfaction

Information Use	User Satisfaction
Amount/duration of use	**Satisfaction with specifics**
Actual vs. reported use	**Overall satisfaction**
Nature of use: use for the intended purpose, appropriate use, type of information used	**Information satisfaction: Difference between information needed and received**
Motivation to use	**Enjoyment**

Source: (*Hellesten and Markova: 2009)*

Table 2-3: Examples of Success Measures – Organisational and Individual Impact

Individual Impact	Organisational Impact
Learning	**Operating Cost Reductions**
Decision Effectiveness; Decision Quality; Improved Decision Analysis, Correctness, time to make decisions	**Staff Reductions**
Problem Identification	**Improved Work Volume**
Improved Individual productivity	**Overall Productivity gains**
Task Performance	**Increased work volume**
Willingness to pay for Information	**Service effectiveness**

Source: (*Hellesten and Markova: 2009)*

2.8 Conceptual Framework

This section presents the conceptual model that guides this study. A quantitative study will be designed to test the research model depicted in Figure 2.3. The following hypotheses relating to the factors affecting the adoption and usage of LMSs were derived.

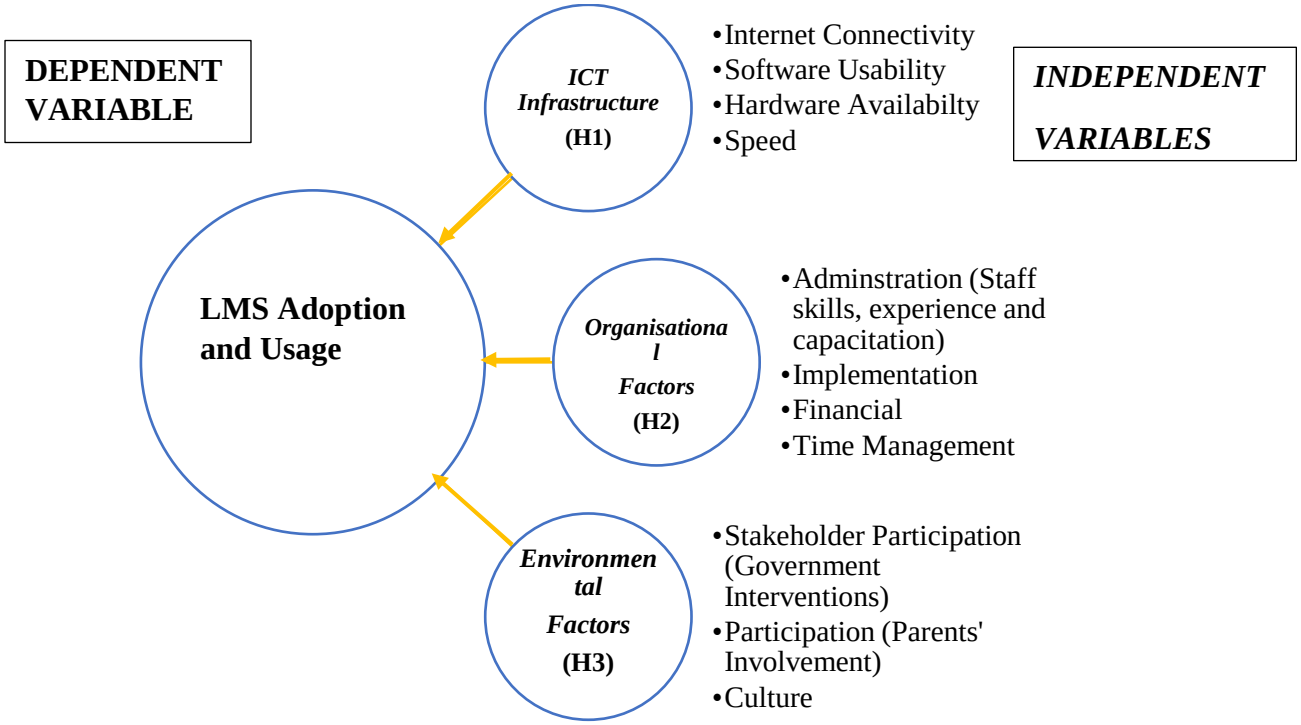

Figure 2-3: Conceptual Model (Source: Author's Elaboration)

2.8.1 Proposed Hypothesis for the Study

The following hypothesis is formulated for the study.

H1: ICT infrastructure availability has a significant impact on the adoption and usage of LMSs

H2: Positive Organisational factors have a significant impact on the adoption and usage of LMSs.

H3: Positive environmental factors have a significant impact on the adoption and usage of LMSs

2.9 Empirical Review

This section provides similar studies on the adoption and usage of LMSs in the COVID-19 context, which had been carried out by other researchers.

2.9.1 China Case Study

The closure of schools because of the COVID-19 pandemic affected all countries in the world, unlike other pandemics where the effects were only felt in specific countries. Different countries around the world responded to COVID-19 by implementing nationwide school closures in the first quarter of

2020 (Viner *et al*., 2020). China is the first country worldwide to provide massive online education programmes to hundreds of millions of students for the prevention and control of the pandemic (Huang *et al*., 2020; McAleer 2020). China's experience in teaching and learning during the COVID-19 lockdown is an interesting one because it was the first country to embark on such an exercise (Ji *et al*., 2020).

In response to the outbreak, the Chinese government initiated a series of emergency management mechanisms, including social distancing which translated to the shutting down of schools (Ji et al. 2020; McAleer 2020; Wang *et al*., 2020). According to Huang *et al*., (2020), during the COVID-19 outbreak, the Chinese Ministry of Education launched the 'Disrupted Classes, Undisrupted Learning' initiative, providing flexible online learning to over 270 million students. Zhang *et al*., (2020) used a different term from the one used by Huang *et al*., (2020). They referred to the approach adopted by China as 'Suspending Classes without Stopping Learning'. The two terms used by these authors carry the same meaning and the difference could have arisen due to technicalities in translating from Chinese to English.

As a response to the COVID-19 outbreak, the Ministry of Education in China coordinated 22 online courses at the national level (Huang *et al*., 2020). Resources such as filmed lectures and educational games were put in place to be used in online teaching. The aim was to integrate teaching resources, provide rich, diverse, selectable, and high-quality online resources for all students across the country, and support teachers' online teaching and children's online learning (Zhang *et al*., 2020).

In implementing the policy that guided teaching and learning during the pandemic, the government of China followed the following five steps:

- *Integrating national resources and planning at the top level:* The government took an initiative to guarantee the provision of reliable network provisions. The Ministry of Education, together with several telecom operators committed to the maintenance of public service platforms and school networks. The Ministry of Education approved 37 qualified institutions and Internet companies to provide online teaching services.

- *Training of teachers:* The education administration made efforts to provide training to teachers on online teaching. Schools also complemented the government's efforts by appointing online teaching technology consultants to support online teaching.

- *Enabling local authorities and schools to carry out online teaching in line with local conditions:* To ensure the reach of information and resources to all students, including those in remote areas, the government worked on circulating teaching information in multiple ways using satellite TV in areas where there was no Internet coverage.
- Formulating guidelines to prepare for a smooth transition back to normal face-to-face education after the epidemic.
- Working on a plan for school reopening after the epidemic. A plan to have schools reopen in a staggered manner was put in place (Huang *et al*., 2020; Zhang *et al*., 2020).

In China, several web-based platforms were integrated into LMS and these included DingTalk, National Public Service Platform for Educational Resources, PEP Touch and Read, Rain-Classroom, National Cloud Classroom and One-Stop Learning, amongst others (Huang *et al*., 2020). 'DingTalk' is a multiterminal platform for free communication and collaboration that also supports the mutual transmission of files between mobile phones and computers. This platform offers online teaching, online homework submission and correction, online examination and online conferencing for all teachers, managers, and principals (Huang *et al*., 2020). 'DingTalk' has widely been used in live-streaming classes by many primary and secondary schools in 17 provinces in China to resolve school closures caused by COVID-19 (Huang *et al*., 2020).

'PEP Touch and Read' is another digital platform that was provided by People's Education Press (PEP). The PEP is a large professional company affiliated with the Chinese Ministry of Education which provided open and free access to all digital teaching resources to primary and secondary schools through the 'PEP Touch and Read' platform. The digital textbooks provided through 'PEP Touch and Read' came with thousands of video and audio micro-courses synchronised with textbooks (Huang *et al*., 2020). These digital textbooks involve nearly 600 varieties of more than 20 disciplines. Another platform is 'Rain-Classroom', which is a smart teaching tool to enhance the interaction between teachers and learners and to make teaching online more convenient (Huang et al. 2020). Through 'Rain-Classroom', students can answer real-time questions and interact with teachers through live broadcasts. The 'National Cloud Classroom' provides e-textbooks compiled by the education department (Huang *et al*., 2020).

Four channels of China Education Television started open broadcasting covering 75 lessons on air to provide learning in remote areas without Internet or cable TV (Huang *et al*., 2020). China's efforts in the provision of remote teaching are commended in that learners without access to the Internet were included in education through other means, such as television. Given China's diverse approaches meant to suit each existing ICT infrastructure, this study argues that Zimbabwe should have also adopted a variety of approaches in the delivery of lessons depending on the available ICT infrastructure in each physical environment.

Although China's approaches to LMSs during the COVID-19 pandemic are celebrated, it should, however, be noted that the implementation of these approaches did not go without challenges (Huang *et al*., 2020). The difficulties faced in the implementation of remote teaching during the COVID-19 pandemic in China include challenges of infrastructure, availability of online teaching resources, teachers' inability, and lack of experience in using online teaching, distractions associated with working from home, lack of clarity on the teaching mode and pedagogy that works best for online education (Zhang *et al*., 2020). These challenges faced by China should also serve as a lesson to South Africa.

2.10 Chapter Summary

The use of LMS for pedagogy has been studied for many decades. Findings from previous research support the vital importance of using such systems to enhance pedagogue, especially in the COVID-19 scenario. The next section will focus on the methodology guiding the study.

3 CHAPTER THREE: METHODOLOGY

3.1 Introduction

This section outlines the methodology used to guide this study. It outlines the research paradigm, research design to be adopted for the target population, sample size calculation, sampling techniques in picking up research participants from the targeted population until the required sample size was achieved, sources of data for the study, data collection instruments to be administered, validity and reliability of data instruments, ethics to be observed before, during and after the study and data analysis and presentation tools.

3.2 Research Paradigm/ Philosophy

Research philosophy relates to the development of knowledge and the nature of that knowledge (Mackenzie and Knipe, 2006). In this research, pragmatism was used to guide the study. Pragmatism provides a set of assumptions about knowledge and enquiry that underpins the mixed methods approach which distinguishes the approach from purely quantitative approaches based on a philosophy of (post) positivism and purely qualitative approaches based on a philosophy of interpretivism or constructivism (Cresswell, 2013; Mackenzie & Knipe, 2006).

Recently, mixed-methods research has attracted much attention. This is because it can help in achieving integration between quantitative and qualitative data/findings (Saunders *et al.* 2016). This study adopted the explanatory sequential mixed-methods approach to research. It initially focuses on quantitative data because of the nature of the research problem and research questions (Cresswell, 2013). After obtaining statistical findings, the study explores deep insights from interviews using a thematic analysis approach.

The interview data helped in improving the quantitative findings of the study by providing additional scope for analysis to explore the adoption of LMSs and increasing the robustness of the empirical findings obtained from the quantitative approach (Saunders *et al*., 2016). Interviews provide in-depth insights into the search for vital considerations for an effective LMS adoption model which arguably cannot be developed through quantitative analysis (Johl, Bruce & Binks, 2012). Cresswell (2018) argues that quantitative data alone cannot provide sufficient explanations for findings obtained through statistical analysis. The quantitative analysis does not offer a detailed interpretation and as such interpretations are less likely to shed light on "why" a social phenomenon occurs. To further provide credence for the adoption of the pragmatism approach (Cresswell, 2011: 47), Boyd *et al*.,

(2012) and Molina-Azorin (2012) argue that pragmatism permits more reliable and credible findings than any single method.

3.3 Research Methods

This study used a mixed methodology, which combines both qualitative and quantitative methods. Q**ualitative research** was conducted to understand the teachers' experiences and perspectives as a way of assessing their adoption and usage of LMSs. Qualitative research explores a problem to understand a phenomenon (Creswell, 2012). Qualitative research is a method of inquiry employed in many different academic disciplines, traditionally in the social sciences, but also in market research and other contexts (Denzin *et al*., 2015). According to Creswell, (2012), qualitative research is useful for studies at the individual level, and to find out, in-depth, how people think or feel. In this study, interviews were conducted to acquire qualitative data. Ten teachers drawn from 10 schools in Limpopo Province were interviewed. Atleast two teachers from two different schools were chosen from each of the five districts. Studies have revealed how technology can improve student learning, but further research is needed to investigate teacher pedagogy and satisfaction (Al-Ani, 2013; Delialioglu, 2012).

Quantitative research was conducted with students. A quantitative research orientation was adopted for the study. Quantitative research gathers data in a numerical form which can be put into categories, in rank order, or measured in units of measurement (Denzin *et al*., 2015). The choice of this design in this study followed several aspects. Quantitative design research orientation allows the collection of data that can be quantified easily. The design made use of questionnaires as research instruments to collect voluminous data that was easy to quantify and could be administered over a short period cheaply. The design was compatible with the positivism philosophy, quantitative methodology and deductive approach. The choice of a quantitative research orientation in this study is also influenced by the limited time and financial resources. The study was conducted over a short time and hence the researcher chose a survey to get a snapshot of the adoption of LMS in private schools in Limpopo Province. Lack of finance resulted in the researcher opting for the quantitative orientation since the strategy allows researchers to use questionnaires as research instruments that can be administered to gather voluminous data cheaply and easily to quantify and analyse.

3.4 Research Designs

Broadhurst *et al*., (2012) define research design as the structure of enquiring. Parahoo (2014), describes a research design as a plan that pronounces how, when and where data are to be collected

and analysed. This is done to increase the valid answers to the research question. The purpose of a research design is to select and define the overall structure and methods of intended research that will enable answering the initial research question effectively and efficiently. This study employed both quantitative and qualitative research designs. The quantitative research component used a descriptive research design in the form of a cross-sectional survey because of its conclusive nature and its ability to provide results that can be used in decision-making. In the qualitative research segment of the study, a case study research design was used

A **Cross-sectional descriptive design** was used to explore the adoption of an LMS in schools from the perspective of students in the Limpopo Province because it is the most successful way of obtaining descriptive information. According to deVaus (2001:175), a cross-sectional design can be ideal for descriptive analysis. "If we simply want to describe the characteristics of a population, their attitudes, their voting intention or their buying patterns then the cross-sectional survey is a most satisfactory way of obtaining this descriptive information".

On the other hand, a **case study design** is an in-depth study of a research problem rather than a sweeping statistical survey or comprehensive comparative inquiry (University of Southern California Libraries, 2016). It is often used to narrow down a very wide-ranging field of research into one or a few easily researchable examples. In addition, a case study research design is a suitable technique where little is known about an issue or phenomenon. It was chosen for this reason, since, LMS is a new phenomenon in private schools in South Africa, which was brought into consideration in the wake of COVID-19.

The design can extend the experience and add strength to what is already known through past research, thus enabling the researcher to fill the gap left by previous studies. Instrumental case studies elucidate a particular issue, and, in general, allow the researcher to develop a relationship with the participants, allowing for a deep understanding to be developed (Creswell, 2012; Merriam, 2009). The present study enabled the researcher to broaden their understanding of a complex issue through detailed contextual analysis of a limited number of events or conditions and their relationships.

3.5 Target Population

A target population is a well-defined collection of participants who have common binding characteristics (Explorable.com, 2009). The participants chosen for this study are teachers and students in private colleges in Limpopo Province, South Africa. According to College SA (2020),

Limpopo province has 37 private colleges that are registered with the Department of Higher Education and Training. Limpopo is the northernmost province of South Africa. It is mostly rural and has five districts, namely, Capricorn, Waterberg, Mopani, Vhembe, and Sekhukhune, all of which are accessible to the researcher. 1000 students and 102 teachers were determined to be the target population.

3.5.1 Sample Size and Sampling for the Quantitative Research Strand

Sample size refers to the number of elements to be included in the study (Malhotra, 2012). An appropriate sample size was calculated and a representative sample size with known confidence and risk levels was selected, based on the work of Yamane (1967) formula. An appropriate response rate (sample size) was determined. In determining the size of the sample in this study, the researcher used the Yamane (1973) formula which states that the desired sample size is a function of the target population, and the maximum acceptable margin of error is referred to as the sampling error. The study used a 5% margin of error. The formula used to generate the sample size as provided by Yamane (1973) is as follows:

$n = N / 1+ N e^2$

Where, n = the sample size

N = the target population size

e = the acceptable sampling error which is 5%

(Source: Yamane, 1967)

$n= 1000/ 1 + 1000 (0.05)^2 = 285.714$

Therefore, the sample size for the study is **286.**

Alvi (2016), defined sampling as the process through which a sample is extracted from a population. The study employed a probability and non-probability sampling method. The methods imply that every element of the population has an equal chance of being included in the sample.

The research used the probability sampling technique because it allowed the target population to be signified in the sample and it is precise. Saunders *et al*., (2016) suggested that if a study is using statistical analysis, probability sampling is the ultimate to have generalized outcomes. The investigator adopted cluster sampling.

In **cluster sampling**, the target population is first divided into mutually exclusive and collectively exhaustive subpopulations or clusters. A random sample of clusters is selected based on a probability sampling technique. For each selected cluster, either all the elements are included in the sample, or a sample of elements is drawn probabilistically. If all the elements in each selected cluster are included in the sample, the procedure is called one-stage cluster sampling. If a sample of elements is drawn probabilistically from each selected cluster, the procedure is two-stage cluster sampling (Nachimas and Nachimas 2008). The population was divided into clusters of districts across Limpopo province (namely, Capricorn, Waterberg, Mopani, Vhembe, and Sekhukhune) and from the groups; people were randomly selected to be in the sample. Utilizing cluster sampling ensured that all groups concerned were fairly represented in the sample. It also increased the chance of getting more precise information about the variable under study. Hair (2000) supports the use of cluster sampling because it ensures that the population is truly represented, unlike simple random sampling.

3.5.2 Sample Size and Sampling for the Qualitative Research Strand

In contrast to the quantitative strand, non-probability sampling techniques were also employed in this study. The participants for the interviews were selected using **purposive sampling**. Purposive or judgemental sampling as defined by Shapori and Rosen (2004) is a non-representative subset of some larger population constructed to serve a very specific need or purpose. According to Oliver (2010), in purposive sampling, the researcher identifies certain respondents as being potentially able to provide significant data to the study. In this case, the researcher has chosen teachers in exam classes, as they are mostly in need of LMSs since they wanted to recover time lost during COVID-19-induced lockdowns. Purposive sampling was also blended with **accidental or convenience sampling**. Convenience sampling is chosen due to the ease of access of the researcher to the sample population. A sample size of 15 teachers was drawn from the target population of teachers from different private schools in Limpopo Provinces, using purposive and convenience sampling. This sample size allowed reaching a saturation point where extra data to draw necessary conclusions, and any further data collection will not produce more value.

3.6 Data Collection Instruments

In this study, questionnaires and interviews were used as research tools as described in the following section.

3.6.1 Questionnaires

A questionnaire is a simple and rapid tool for collecting data in less time and effort (Khan, 2009). An online survey was used to gather data from teachers. The survey was developed based on a literature review that was conducted concerning the adoption of technology in learning.

By using this tool hundreds or even thousands of individuals can participate (Khan, 2009). The questionnaires comprised both open-ended and closed-ended questions to accommodate the views of the participants in the survey, thus enabling the researcher to evaluate the results and provide an objective judgment (Driscoll, 2011). Closed questions were used to obtain specific answers, which helped in achieving the research purpose. Thus, the use of the questionnaires provided accurate data and enabled the researcher to analyse the collected data without ambiguous results. The nature of the questioning was flexible leading uncovering of attitudes and opinions that could not have been revealed in one-on-one interviews. In addition, the questionnaire offered insights into how a group thinks about an issue.

However, questionnaires had a few limitations. Some respondents gave ambiguous answers to open-ended questions while others did not answer all questions as they viewed some questions as important. To address this limitation the researcher made phone calls to do follow-ups of the questionnaires.

3.6.1.1 Survey Instrument Development

A survey questionnaire was deployed to obtain data for this study. The research questionnaire comprised three sections. The first section consisted of demographic questions and gathered data regarding student background including age, gender, grade, educational level, and LMSs used. The second section involves the independent variables of the study, which are ICT infrastructure availability, organisational factors, and environmental factors. The third part included questions pertaining to the dependent variable, which is LMS adoption. Close-ended questions were answered in Likert scale format.

3.6.2 Interviews

An interview is “an interchange of views between two or more people on a topic of mutual interest, sees the centrality of human interaction for knowledge production, and emphasizes the social situations of research data” (Kvale, 1996) as cited by Al-Faquha (2013:39). There are three types of interviews, namely unstructured interviews, semi-structured interviews, and structured interviews

(Corbetta, 2003). In this study, the researcher used structured interviews. Structured interviews enable participants to answer as they want with limitations. Phone call interviews were conducted with the schoolteachers. During the interviews the researcher organised discussions that evolved around certain sub-questions from the participant's speech.

Interviews facilitated instant feedback from the respondents and the researcher could understand well. This helped the researcher to grasp more aspects. Since interviews enabled observation of different interviewee expressions (stressing of points), the researcher was able to see what was communicated and the respondents could also tell if they had misunderstood some of the questions. This will go a long way in enriching the validity and reliability of the study.

3.7 Reliability and Viability

To achieve reliability and validity, the questionnaire was designed in such a way that it was understood by all participants. The following steps were undertaken to ensure that reliability and validity were measured and taken into consideration.

3.7.1 Reliability

Reliability is the consistency of responses; the degree to which an instrument measures, in the same way, each time under the same conditions. Reliability is used to ensure internal consistency and to achieve a high degree of homogeneity between questionnaire statements (Al-Fuquha, 2013). Reliability was tested using Cronbach's Alpha, as argued by Alhamdani, *et. al*., (2006) that Likert scale questionnaires should use the method. An alpha of 0.7 was adopted as the benchmark for measuring the reliability of items contained in the questionnaire. The researcher accepted constructs that have an alpha greater than 0.7.

3.7.2 Validity

Validity measures the research tool's soundness; it ensures that the research tool is measuring what researchers intend to measure or want to measure (Al-Fuquha, 2013). There are three methods to measure the validity of the research tool, which are, content validity, criterion-related validity, and construct validity. In this study, the researcher worked on different issues to achieve the validity of the questionnaires. These issues are:

- The literature used to design a research model for design the adoption of an LMS with validity and reliability that is tested and trusted.

- Reliability was checked to ensure the consistency of the questionnaire. Research tool consistency is an indicator of a well-designed questionnaire that can achieve the research purpose.
- Some questions which were included in the questionnaire were related to each other. Therefore, they should be answered in a specific coherent way.

To ensure the quality of results from interviews, the researcher strove to adhere to the principles of trustworthiness throughout the research. Trustworthiness of data addresses issues of credibility, transferability, dependability, and conformability, which in quantitative research design are equivalent to internal validity, external validity, reliability, and objectivity, respectively (Guba & Lincoln, 1994). Trustworthiness is a method of ensuring rigour in qualitative research without sacrificing relevance. The findings of the research were the real issues which teachers and learners experienced during the adoption and usage of LMSs.

3.8 Ethical Considerations

Within the realm of educational research, ethics is concerned with ensuring that the interests and well-being of people are not harmed because of the research (Saunders *et al*., 2016). Cresswell (2018) describes ethics as indicative of the moral dimensions of what is right and wrong while one is involved in research. As a researcher, I was continuously guided by ethical principles throughout the study. All participants were given letters elucidating the research study, including the rationale as well as the data collection methods that were to be employed. I obtained permission from the Limpopo Department of Education to conduct research in the schools. The researcher also obtained permission from the school principals and teachers to gather information from the teachers and students. The research was conducted during the time allowed by the principal. The researcher selected teachers and learners on the basis that they were willing to participate and able to articulate their experiences of the implementation of the LMS. Participation was only allowed after careful reading, understanding, and signing of consent forms. The consent form informed the participant of his or her voluntary participation and of their right to withdraw from the study at any time. In terms of possible benefits and risks, the participants were informed that there were no risks involved in the study.

3.9 Data Analysis and Presentation Procedures

Data analysis involves an examination of what has been collected in the survey making deductions and drawing inferences (Saunders *et al*., 2016). Before the analysis of quantitative data, it would be checked to ascertain whether it was complete and consistent. The data was sorted to make sure it was orderly and was edited to discard errors to pinpoint any problem that could have occurred due to the utilization of the questionnaire. The quantitative data in the current inquiry was scrutinized by using descriptive and inferential statistics with the help of the STATA version 16 software. The data was first analysed using descriptive statistics means, frequencies, standard deviation, and percentages to bring out trends and interdependencies between variables.

Further, for the inferential statistics, a correlation test was performed before the regression analysis. Correlation tests were used to test the relation and strength of the relationship between independent and dependent variables. Regression analysis was used to provide insight into the relationships between the variables. Regression measures the association between dependent and independent variables (Sigmund, *et al*., 2010).

Descriptive statistics include the frequency, mean, percentages and standard deviation. Data were presented using comparative tables showing percentages and frequencies and by the use of charts. Inferential statistics in the form of correlation and regression analysis were computed and used to determine the nature of the influence of ICT infrastructure and organisational and environmental variables on LMS adoption and usage, and in testing the research hypotheses. In addition, a multiple regression model was adapted to determine the relative significance of each of the three predictor variables relative to the antecedent variable. Study findings were presented in the form of tables and graphs.

Qualitative methods of analysing data were also adopted since this study was partly qualitative. Denzil and Lincoln (2013) describe qualitative data analysis as working with data, organising it, breaking it into manageable units, synthesising it, searching for patterns, discovering what is important and deciding what could be learned and imparted to others. The researcher used Braun and Clarke's (2006) thematic data analysis method of analysing data whereby the analysis commenced with a) reading or familiarising myself with the data obtained from interviews, b) generating codes for the participants to ensure confidentiality so that I could be the only one who can identify them, c)

searching for themes, reviewing the themes, and defining and naming them and e) lastly, I produced the final report.

3.10 Chapter Summary

This chapter discussed the research methodology, research design, and research instruments that were used by the researcher in conducting the research. It also discussed the target population, the sampling methods used and the sample size. Ethical issues were also addressed in this chapter.

4 CHAPTER FOUR: RESULTS AND DISCUSSION

4.0 Introduction

This chapter presents the results of the study, organised according to the sequence of the study objectives. The chapter is divided into quantitative and qualitative analysis strands, which are discussed in this chapter. The overarching purpose of the research was to establish the level of adoption of LMSs by private schools during the COVID-19 pandemic in South Africa, focusing on the Limpopo Province. In the quantitative strand, LMS adoption was the dependent variable, with ICT infrastructure availability, organisational factors, and environmental factors as the independent variables. The results of the descriptive and inferential analyses and their discussion are presented first. Qualitatively, during the interviews, various issues were discussed, and opinions were provided. The researcher found that there was a plethora of recurring themes that were raised. Instead of presenting the qualitative findings based on objectives, the study adopts a thematic presentation for the findings of this study. However, the identified themes helped in advancing the set goals of this study. Each theme has several categories of descriptions that emerged from the data analysis process. These were then described and explained based on extracts from participants' statements that explained the meaning of the content generated. A discussion and chapter summary concludes the chapter.

4.1 Quantitative Analysis Results

4.1.1 Questionnaire Response Rate

In total, 286 questionnaires were distributed to respondents selected for the research. The response rate of the questionnaire for this study is presented in Table 4.1 below.

Table 4-1: Questionnaire response rate

Research Tool	Administered	Collected	Frequency (%)
Questionnaires	286	280	97.9

Table 4.1 reveals that a total of 97.9% of the target respondents responded. While some researchers claim a 100% response rate is possible, others point out that some questionnaires never get returned or become spoilt in transit. Creswell (2018) argued that scientific procedures must be employed for a sample to accurately represent the community at large, and more than 70% of the population must

answer. Additionally, Mugenda and Mugenda (2019) note that the response rate is very praiseworthy because it was far higher than the suggested criterion of 75% for the examination of the data. A response rate of 50% is sufficient for analysing and reporting, a rate of 60% is good, and a 75% or more rate is exceptional (Mugenda and Mugenda,2019). This high response rate in this study was made possible because interviews were conducted under the researcher's careful observation, making it possible to conclude the project. A high response rate indicates that there is enough information to conclude the adoption of LMSs by private schools during the COVID-19 pandemic in South Africa.

4.1.2 Reliability Test

Cronbach's alphas were determined for each construct to assess the items' internal consistency. The internal consistency of the questionnaire data was examined using Cronbach's Alpha. ICT infrastructure availability, organisational factors, environmental factors and LMS adoption, respectively, were the study variables subjected to a reliability test. The findings show that the research variables' dependability coefficient exceeds the threshold value of 0.70 (Kothari, 2004). For each questionnaire construct, the reliability coefficients, or Cronbach's alphas, are shown in Table 4.2.

Table 4-2: Cronbach's Alpha

Variable	Items	Scale Reliability Coefficients
ICT infrastructure availability	4	0.8646
Organizational factors	4	0.8808
Environmental factors	4	0.8769
LMS Adoption	5	0.9299
Overall	**17**	**0.88805**

ICT infrastructure availability was summarised by four items, as listed in Table 4.2. These four items have a reliability coefficient of 0.8646. The researcher accepted all four items for this framework because the coefficient was higher than the 0.7 threshold. Likewise, organizational factors, environmental factors, and LMS adoption items have an alpha of 0.8808, 0.8769, and 0.9299. The overall reliability coefficient for the 17 items included in this study was 0.914, suggesting high levels of internal consistency. Reliability testing has shown that each question on the questionnaire is crucial and omitting any of them would make the survey less trustworthy. In other words, these items have proven to be critically important to the questionnaire after reliability testing, and their

absence would make the questionnaire less reliable. Because the questionnaire for this study was determined to be trustworthy, its findings can be believed.

4.1.3 Demographics

Section A of the questionnaire collected demographic-related information from the respondents. This data included gender, age, grade, and LMS adopted.

Table 4-3: Respondent's Demographics

Variables	Categories	Frequency n = 280	Frequency (%)
Gender	Male	138	49.3
	Female	142	50.7
Age	15	52	18.6
	16	35	12.5
	17	98	35.0
	18	95	33.9
Grade	10	77	27.5
	11	97	34.6
	12	106	37.9
LMS	D6	98	35.0
	Moodle	87	31.1
	Edu Pac	68	24.3
	Google Classroom	27	9.6

Demographic data shows that there was a gender balance, whereby male students were 49.3% and females were 50.7%. This balanced representation was vital as opinions from both genders were considered. The range 17 years and 18 years dominated the respondents' population with 35% and 33.9% respectively. The dominance of mature age groups gave the investigator the courage to trust the study results. Students in grades 11 and 12 dominated the study population with 34.6% and 37.9%, respectively. This was important because these were examination classes affected by school closures during the COVID-19 lockdowns. D6 LMS dominated in the sampled schools with 35% followed by Moodle with 31.1%. Edu Pac has 24.3% and Google Classroom with 9.6%.

4.1.4 Descriptive Analysis

In the same way that descriptive statistics are used in studies that employ a ratio or interval scale to elicit responses, this study also used descriptive statistics to give the data context because the Likert scale is an interval scale. Since respondents were supposed to agree or disagree with a statement, the

minimum and maximum scale grades for the interval scaled data shown below are 1 and 5, respectively, with 1 denoting strongly disagree and 5, respectively.

This was accomplished by having participants fill out a 5-point Likert scale, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4=Agree, and 5 = Strongly Agree, for each of the statements provided in the tables below. The obtained data were used to calculate the mean and standard deviation of the responses to demonstrate their distribution. Each item's mean and standard deviation are shown in the next section.

4.1.5 Descriptive Statistics

The first factor that affected LMS adoption was ICT infrastructure availability.

Table 4-4: Descriptive Analysis of ICT infrastructure availability

Item	n	Mean	Std. Dev.
Materials for learning through LMS are readily available	280	4.982 (Agreed)	.133
I have a device to engage LMS learning	280	5 (Strongly Agreed)	0
I have a good internet connection	280	4.989 (Agreed)	.103
Data/ Wi-Fi for the internet is available and affordable	280	4.961 (Agreed)	.244
Av Total		**4.983 (Agreed)**	**0.12**

As shown in Table 4.4, the overall aggregate average score of the analysis stands at 4.983 and has a standard deviation of 0.12. This suggests that the respondents confirm that ICT infrastructure impacts LMS Adoption.

The following statements support this: a) Materials for learning through LMS are readily available (M=4.982, SD= 0.133), b) I have a device to engage LMS learning (M=5, SD= 0), and c) I have a good internet connection (M= 4.989, SD= 0.103) and d) Data/ Wi-Fi for the internet is available and affordable (M=4.961, SD= 0.244).

The research also ascertained the impact of organisational factors on LMS adoption.

Table 4-5: Descriptive Analysis of Organisational Factors

Item	n	Mean	Std. Dev.
E-learning is very economical for educational institutions to adopt.	280	4.889 (Agreed)	.43
There is adequate ICT support	280	4.986	.119

		(Agreed)	
My institution has enough teaching-learning resources to carry out e-learning	280	4.921 (Agreed)	.307
My teachers have the technical skills to adequately take us through the LMS	280	4.825 (Agreed)	.537
Av Total		**4.905 (Agreed)**	**.348**

As in Table 4.5, the overall aggregate mean score of the analysis stands at 4.905 and has a smaller standard deviation of 0.348. This suggests that the respondents endorse that organisational factors impact LMS adoption.

This is supported by the following statements: 'a). E-learning is very economical for educational institutions to adopt (M= 4.889, SD=0.43), b) There is adequate ICT support (M= 4.986, SD=0.119), c) My institution has enough teaching-learning resources to carry out e-learning (M= 4.921, SD=0.307), and d) My teachers have the technical skills to adequately take us through the LMS (M= 4.825, SD=0.537).

The last independent variable that was assessed was the environmental factor.

Table 4-6: Descriptive Analysis of Environmental Factors

Item	n	Mean	Std. Dev.
My parents/guardians have supported me in embracing e-learning	280	4.921 (Agreed)	.307
I get motivation from my peers to know more features of LMS	280	4.429 (Agreed)	.657
LMS is boring and unengaging	280	4.818 (Agreed)	.463
E-learning increases learners' social isolation	280	4.407 (Agreed)	.591
Av Total		**4.644 (Agreed)**	**.505**

As indicated in Table above, 4.644, the overall aggregate mean score of the analysis stands at 4.847 and has a smaller standard deviation of 0.505. This shows that the respondents confirm that environmental factors impact LMS adoption.

The following statements support this: 'a) My parents/guardians have supported me in embracing e-learning (M= 4.921, SD= 0.307), b) I get motivation from my peers to know more features of LMS (M= 4.429, SD= 0.657), c) LMS is boring and unengaging (M= 4.818, SD= 0.463), and d) E-learning increases learners' social isolation (M= 4.407, SD= 0.591).

The study's independent variable was LMS adoption and had the following descriptive statistics:

Table 4-7: Descriptive Analysis of LMS Adoption

Item	N	Mean	Std. Dev.
I prefer using a computer to do my lessons	280	4.946 (Agreed)	.282
I believe using e-learning technologies will improve my exam performance	280	4.814 (Agreed)	.6
Computers make work more interesting.	280	4.932 (Agreed)	.292
Using e-learning technologies will allow me to accomplish more work than would otherwise be possible	280	4.654 (Agreed)	.676
LMS provide me with better learning opportunities than traditional means of learning	280	4.846 (Agreed)	.495
Av Total		**4.838 (Agreed)**	**.469**

Table 4.7 shows that the average aggregate score is 4.838 with a smaller standard deviation of 0.469. In other words, the respondents agree that ICT infrastructure availability, organisational factors and environmental factors help increase LMS adoption.

This is supported by the following statements 'a) I prefer using a computer to do my lessons (M= 4.946, SD= 0.282), b) I believe using e-learning technologies will improve my exam performance (M= 4.814, SD= 0.6), c) Computers make work more interesting (M=4.932, SD= 0.292), d) Using e-learning technologies will allow me to accomplish more work than would otherwise be possible (M=4.654, SD=0.676) and LMS provide me with better learning opportunities than traditional means of learning (M=4.846, SD=0.495).

4.1.6 Inferential Analysis

Inferential statistics were used in this study to analyse the data. Testing the stated hypothesis was part of inferential statistical analysis. The researcher conducted several statistical tests based on the significance level, which is used to determine whether to accept or reject the hypothesis. The likelihood that a test result is the result of chance is how Saunders et al. (2016) define statistical significance. The significance level reflects the highest risk one is prepared to accept while rejecting the true null hypothesis.

The significant values were taken from the tables using Pearson product correlation. The technique of employing data analysis to infer characteristics of an underlying probability distribution is known

as statistical inference. By generating estimates and testing hypotheses, for instance, inferential statistical analysis infers characteristics of a population. The observed data set is thought to be a sample of a broader population. Comparable to descriptive statistics is inferential statistics. The focus of descriptive statistics is exclusively on the characteristics of the observed data; it is not predicated on the idea that the data are representative of a wider population. The researcher conducted inferential statistical analysis to put the posed theory to the test.

4.1.6.1 Pearson's Correlation Analysis

The study used the Pearson correlation test to study the influence of independent variables and the dependent variable.

4.1.6.1.1 Analysis of ICT Infrastructure Availability and LMS Adoption

H_1: ICT infrastructure availability has a significant impact on the adoption of LMSs

Table 4-8: Pearson's Correlation of ICT Infrastructure and LMS Adoption

Variables	(1)	(2)
(1) ICT Infrastructure Availability	1.000	
(2) LMS Adoption	0.541*	1.000
	(0.000)	

**** p<0.01, ** p<0.05, * p<0.1*

From Table 4.8, it can be inferred that LMS adoption is significantly correlated, as evidenced by the correlation coefficient of 0.541 and the p-value of 0.000, which is less than 0.05. This is a strong positive relationship. These findings support the hypothesis that there is a significant relationship between ICT infrastructure availability and LMS adoption.

4.1.6.1.2 Analysis of Organisational Factors and LMS Adoption

H_2: Positive Organisational factors have a significant impact on the adoption of LMSs

Table 4-9: Pearson's Correlation of Organisational Factors and LMS Adoption

Variables	(1)	(2)
(1) Organizational Factors	1.000	
(2) LMS Adoption	0.883*	1.000
	(0.000)	

**** p<0.01, ** p<0.05, * p<0.1*

From Table 4.9, it can be inferred that organisational factors and LMS adoption are significantly correlated, as evidenced by the correlation coefficient of 0.883 and the p-value of 0.000, which is less than 0.05. This is a very strong positive relationship. These findings support the hypothesis that there is a significant relationship between organisational factors and LMS adoption.

4.1.6.1.3 Analysis of Environmental factors and LMS Adoption

H_3: Positive environmental factors have a significant impact on the adoption of LMSs

Table 4-10: Pearson's Correlation of Environmental Factors and LMS Adoption

Variables	(1)	(2)
(1) Environmental Factors	1.000	
(2) LMS Adoption	0.868*	1.000
	(0.000)	

**** p<0.01, ** p<0.05, * p<0.1*

From Table 4.10, it can be inferred that environmental factors and LMS adoption are significantly correlated, as evidenced by the correlation coefficient of 0.868 and the p-value of 0.000, which is less than 0.05. This is a very strong positive relationship. These findings support the hypothesis that there is a significant relationship between environmental factors and LMS adoption.

4.1.6.2 ANOVA

The Analysis of Variance (ANOVA) is a tool used in statistics to differentiate variances between experimental group means (Creswell, 2018). This is as shown in Table 4.11 below:

Table 4-11: ANOVA Analysis

Number of Obs	280	R-squared	0.8795
Root MSE	0.169693	Adj R squared	0.8777

Source	Partial SS	Df	MS	F	Prob>F
Regression (Model)	57.781159	4	14.44529	501.65	.00000
ICT Infrastructure Availability	3.1862645	1	3.1862645	110.65	.00000
Organisational Factors	4.0811594	1	4.0811594	141.73	.00000
Environmental	6.3646843	2	3.1823422	110.51	.00000

Factors					
Residual	7.9188406	275	.02879578		
Total	65.7	279	.23548387		

a. Predicted - Dependent Variable: LMS Adoption

b. Predictors – Independent Variables: (constant), ICT Infrastructure Availability, Organisational Factors and Environmental Factors

At a 0.000 level of significance, ICT Infrastructure Availability, and Organisational and Environmental Factors' influence on LMS vary in strength. This demonstrates that the model as a whole was important. The results of the ANOVA table above show that the degree of freedom numerator (df) = 4 and denominator (df) = 275. According to the results, the calculated F on the regression model is higher than the F critical value of 501.65. The results of the one-way ANOVA (F (501.65) = 57.78, p = .000) showed that there was a statistically significant difference between the groups. The p-value is less than 0.05. In terms of R squared and Adjusted R squared, 0.8795 and 0.8777 respectively, are greater than 0.5 expressing a higher significant variability being reflected by the model. The R-squared is greater than 0.5, meaning that the model suggests that there is a significant relationship between the dependent variables and the dependent variable. This suggests that there is a 95% likelihood the association with the variable is not a result of chance.

4.1.6.3 Regression Analysis

The regression analysis employed scrutinizes whether each dimension in this study impacts LMS adoption. The regression model is significant at the 0.05 level (p-value). The regression analysis summarized in Table 4.12 below shows the results.

Table 4-12: Regression Analysis of ICT Infrastructure Availability, Organizational Factors, Environmental Factors and LMS adoption

LMS Adoption	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ICT Infrastructure Availability	.029	.135	0.22	.828	-.237	.296	
Organizational Factors	.831	.063	13.09	0	.706	.956	***
Environmental Factors	.49	.035	14.02	0	.421	.559	***
Constant	1.748	.551	3.17	.002	2.831	.664	***
Mean dependent var		**4.850**	**SD dependent var**				**0.485**

R-squared	**0.873**	**Number of obs**	**280**
F-test	**632.474**	**Prob > F**	**0.000**
Akaike crit. (AIC)	**-181.132**	**Bayesian crit. (BIC)**	**-166.593**

****** p<.01, ** p<.05, * p<.1***

The regression equation below was derived from the regression model (refer to Table 4.12):

Y = β0 + β1 I + β2 O + β3E + ε, becomes

Y = 1.748+ 0.029I + 0.831O + 0.49E + ε

Whereby

Y = LMS Adoption

β0 = Constant

β1, β2, and β3 = Beta Coefficients

I = ICT Infrastructure Availability

O = Organisational Factors

E = Environmental Factors

ε = Error Term

The model demonstrates a statistically significant positive relationship between ICT Infrastructure availability and LMS Adoption (β =0.029, p0.05), a statistically significant positive relationship between organizational factors and LMS Adoption (β =0.831, p0.05), and a statistically significant positive relationship between environmental factors and LMS Adoption (β = 0.49, p0.05). Based on these findings, it can be deduced that colleges are more likely to successfully embrace LMS Adoption when they concentrate on improving ICT infrastructure availability, and organizational and environmental factors. Additionally, the model returns positive coefficients for all independent variables, demonstrating that these factors have a positive impact on LMS adoption. In other words, increasing the independent variables by one unit causes the dependent variable to rise. The study hypothesis test summary is shown below:

Table 4-13: Summary of Hypothesis Test

	Hypothesis	Status
H_1	ICT infrastructure availability has a significant impact on the adoption of LMSs	Accepted
H_2	Positive Organisational factors have a significant impact on the adoption of LMSs	Accepted
H_3	Positive environmental factors have a significant impact on the adoption of LMSs	Accepted

4.2 Qualitative Results Analysis

4.2.1 Participants Profiling

Fifteen teachers were purposively selected as interviewees for this study. The sample consisted of eight female teachers aged between 25 and 55 and seven male teachers aged between 25 and 45. They are permanently employed. For anonymity, they were coded as Teacher 1 to Teacher 15.

4.2.2 Themes

The results are presented, analysed, interpreted, and discussed according to identified themes of LMS adoption. The category, themes, and sub-themes extracted from the interviews with the educators are presented in Table 4-14.

Table 4-14: Category, Themes and Sub-themes

Category	Themes	Sub-themes
LMS Adoption	Challenges Faced by Schools in LMS Adoption	Students learning skills
		Attitudes and Experience
		Teacher Unpreparedness
		Inequalities Encountered by Educators and Learners
	School Mechanisms in Addressing Factors Limiting LMS Adoption	Procurement of relevant technology
		Instructional Approaches to developing students' engagement during E-learning
	Measures for Effective LMS Adoption	Bridging the unequal gap between educators and learners

		Technological capacitation among educators
		Teachers should utilise a variety of online resources
		Teachers should utilise an alternative online assessment

4.2.3 Challenges faced by schools in adopting LMS.

4.2.3.1 Students Learning Skills

This study found that not all students had a similar level of understanding of the online learning system. The teachers revealed that students who have a high proficiency in absorbing information and were also supported by their intrinsic characteristics in learning such as self-discipline, self-regulated learning, proper learning style, good time management, and high self-motivation found e-learning easy, thus corroborating findings from previous studies Adelayanti (2020). However, students who are unfamiliar with the learning materials and methods of learning online experienced difficulties not only in understanding the materials but also in adapting to technology-based applications such as Zoom, Blackboard, Google Classroom, and Moodle. One teacher indicated that:

> *"Extra effort is required to adapt to this new learning model. Teachers and learners should invest their time in learning technical skills related to online learning…"* (Teacher 5).

However, it was also noted that the online teaching and learning model creates a distance between the lecturer and students in terms of interaction, and changes how lecturers give motivation, engage with students, and provide feedback. (It was noted by whom? Reference is needed here).

4.2.3.2 Attitudes and Experiences

The data revealed that both the lecturers and the students approached online teaching and learning with an attitude. This was evidenced by the respondents' fear of adjusting to the new developments in remote online teaching and learning. This is because they have relied on face-to-face teaching and learning methodologies over the years. Notably, several students and lecturers, especially those with no prior computer knowledge and experience were appalled by the demand to adopt remote learning. The negative attitudes towards the new developments hindered students and lecturers from utilizing online learning systems. Reportedly, some had to do so for compliance only, thereby compromising

the quality of education and training during this period of COVID-19. The following extracts illustrate the fear alluded to above.

> *"My fear is being failed on things we have no control over. With regards to remote learning, I'm in favour of it as it facilitated saving the academic year of 2020. However, all that needs some orientation to the new approach to learning" (Teacher 8).*

The negative attitudes and experiences culminated in resistance to support the new online teaching and learning initiatives. There were mixed feelings about teaching online. Some adapted more quickly than others and for most of them, the early awkwardness receded when they became more comfortable with the technology. The analysis shows that senior teachers had fears about teaching online but overcame their fears after attending webinars organized by the colleges and assistance from colleagues. This corresponds with findings from a study by Allen and Seaman (2013) who stated that the attitude of teachers in a high school in the United States was influenced by the user's perception of the ease of use of technology. Hence, it is crucial to understand users' confidence. One teacher had to say:

> *"I'm not sure how much is expected from me or the students when teaching online as everything is so uncertain. Do I have a choice?" (Teacher 11).*

The respondents also felt that they were not given an alternative but were forced to teach online and it made them uncomfortable, but they remained positive.

> *"I don't like to be forced to teach online, but it is alright now. It's sudden and I'm still adjusting, but after a few weeks, it makes me feel less uneasy. Online teaching bothers me; it does take time to make it possible" (Teacher 14).*

This was also supported by another teacher who stated:

> *"Traditional classroom settings are very common, and I am confident establishing that. But in online classroom settings, this is new to us, especially for us teachers in the DepEd" (Teacher 10).*

With time, respondents described teaching online as:

> *"Fine now but initially it turned my life upside down. I had to get help from the younger lecturers each time I called them. So, no problem. I just keep to basics" (Teacher 8).*

4.2.3.3 Teacher Unpreparedness

The study revealed different levels of preparedness for the institutions, teachers, and students, in terms of resources and psychologically as expressed by the respondents. The preparedness referred to in this context is however more of preparation to respond as opposed to preparedness before the pandemic struck.

The teachers highlighted that they were not adequately prepared for remote teaching. Even in the institutions where blended or technology-enhanced learning takes place, teachers were still not fully equipped to engage in full online teaching. However, the majority alluded that:

> *"To capacitate teachers on online teaching, our school embarked on workshops and online training on online learning systems" (Teacher 7).*

The study established that, even though the teachers had experience in teaching on face-to-face platforms, the majority of them, especially the elderly ones were experiencing challenges with online remote teaching demands or were resisting the new change. Across many colleges that adopt traditional face-to-face interfaces in learning, there was little experience with online teaching. This raised the concern of effectiveness and quality of learning outcomes. Moreover, although campus support personnel and teams were usually available to help teachers learn and adopt online teaching, a small pool of teachers was interested in teaching online. One teacher complained that:

> *"The support teams could not offer the same level of support to all lecturers within the short preparation period. This resulted in some teachers improvising quick solutions such as using WhatsApp, and emails to deliver class notes, a cumbersome and stressful process" (Teacher 6).*

However, it was noted that the support team members were also inexperienced in issues of online teaching needs. They had experience with computers or maintaining the systems, but not online teaching. This caused delays and discouraged students and lecturers from using the colleges' official online learning management systems.

4.2.3.4 Inequalities Encountered by Learners and Educators

Educators indicated that they were experiencing a huge burden on their mental health as they had to endure the load of the education system during these difficult times. They had to follow administrative and ministerial directives. Teaching through online media had become a challenging

task for most educators. The lack of resources was also a big hurdle for the teaching-learning process. This distracted the adoption of LMSs in schools. One teacher explained that:

> *"Sometimes unhealthy environments and technical issues are reasons behind the discontinued process of teaching-learning" (Teacher 11).*

The respondent noted that some learners sometimes did not have the proper means to learn from the online medium. As most of the learners and educators are used to the traditional way of teaching-learning the uptake of E-learning was comparatively low. Due to a lack of motivation and shaky mental health issues, E-learning was not providing the expected success in the global education system (Khalid et al., 2016).

4.2.4 Schools' Mechanisms in Addressing Factors Limiting LMS Adoption

4.2.4.1 Procurement of relevant technology

The study identified the presence of institutional goodwill in supporting online teaching and learning. Colleges, where teachers were interviewed, purchased laptops for students and provided internet data for both students and lecturers. This involved budgetary adjustments and fundraising to meet these demands. In addition, the government of South Africa has been instrumental in financing some historically disadvantaged colleges to meet such costs. One teacher said:

> *"At our college, state-of-the-art technology was bought to meet the demands of online learning. I became confident enough and could create an environment that allowed pupils to learn both in the traditional and online classrooms" (Teacher 13).*

4.2.4.2 Instructional Approaches to Develop Student Engagement During E-learning

To accomplish large-scale online education, the teachers noted that it was essential to generate advanced contingency plans to overcome technical problems like traffic overload in the LMSs. Educators divided the teaching material into several smaller modules to enhance students' focus and ensure better understanding. Teacher 1 exclaimed:

> *"Inexperienced lecturers consulted online teaching assistants to ensure the objectives and needs of every class that has to be taken by them" (Teacher 1).*

Educators modified their teaching techniques by providing creative and skilful assignments that could fulfil the learning requirements of the students by engaging them during online classes. The

colleges incorporated online teaching methods and offline self-studying. Teachers engaged students in discussions to encourage interactivity and provide feedback on their assignments. Teacher 2 said:

> *"Through this mode of teaching students will not learn surface, ambiguous and fragmented knowledge. Instead, the students would experience thorough learning through diverse discussions" (Teacher 2).*

In addition, the teachers noted that the difficulty, lengthy and quality of teaching material should match the student's online learning behavioural characteristics and academic readiness. It was also advisable to adopt a few measures for the improvement of student's in-depth participation in online classes. This would help in the generation of high-quality participation of students. Student's mental health should be taken into consideration and various suitable measures should be taken by educators to relieve their mental stress and anxieties during the COVID-19 crisis, to ensure that the students can regularly, effectively and actively participate in their online learning sessions (Brooks, et al., 2020).

4.2.5 Measures for Effective LMS Adoption

4.2.5.1 Bridging the unequal gap between learners and educators

The research revealed that the pandemic had undeniably made clear that countries throughout the globe need to allocate funds for the proper training of educators and to create innovative learning domains that could provide education to learners in the easiest way. This situation of crisis shows the urgency to consider the needs of the learners. Education materials and pedagogical provisions should be introduced in all emergency curricula to keep educators and learners safe and mentally healthy (Pragholapati, 2020). One teacher had this to say:

> *"Education ministers or the government should provide funds for disadvantaged children and focus on the educational needs of marginalized learners" (Teacher 5).*

Importantly national authorities in their respective countries should provide efficient measures to convey the vital significance of well-being for both students and educators.

4.2.5.2 Technological capacitation among educators.

The educators suggested that teachers should enhance their knowledge and skills required for the maximum usage of technological devices, E-learning tools, educational Apps, and other online platforms. In addition, students should be encouraged to use different educational apps and should be provided with easy, effective, and interesting study materials by educators to attract students'

attention towards E-learning. Various online-learning types can be also promoted to students and educators. Teachers could undergo the appropriate online training to use various learning methods such as knowledge-based training, hybrid training, synchronous training, and asynchronous training. Furthermore, the lack of non-verbal communication made assessments only possible through online platforms such as video calls, Skype, and Google Meet. One teacher said:

> *"The teachers must think of the best platforms when conducting both written and oral assessments for the students. However, it became obvious to the respondents that the student work assessed with alternative assessments differed from what would occur in a traditional classroom" (Teacher 12).*

The respondents were aware that each alternative assessment approach must ensure that students achieve the learning outcomes. For example, other common assessment alternatives used by the teachers included multiple-choice items on WhatsApp as indicated by one teacher thus.

> *"I make use of true-false, fill-in-the-blank and open-ended questions to get their understanding of the topic….Students do their assessment and return it, to Dropbox for submission of assignments" (Teacher 8).*

However, the respondents were aware that online assessments were not as good as face-to-face assessments. One teacher stated that:

> *"Assessing online written exams is difficult as the students might not be honest. It is not a good form of assessment" (Teacher 6).*

Students cheating on online quizzes and other tests was a concern as stated by Teacher 7 who indicated that they were *"worried that the students are not honest."*

Students were given immediate feedback and different types of assessments to reduce the possibility of cheating.

4.2.5.3 Teachers should utilise a variety of online resources.

Generally, the respondents commented on their student's ability to understand better when taught using different online resources. Interactive online teaching and learning resources helped teachers to select materials suitable for the topics taught. Teacher 6 indicated that:

> *"I made sure the materials are interesting and useful for the students. So, I used the resources with interactive activities to provide self-paced instruction" (Teacher 6).*

Since the class comprised students with different abilities, the recorded online resources were better understood as they could be replayed. Teachers used online materials directed at the students, so the content could also be covered quickly and enabled the students to work in a self-paced manner. Teacher 8 said:

> *"My class consisted of different-ability students, so I use the materials differently. I could also use the recorded materials in a self-paced manner" (Teacher 8).*

Teachers with low and basic computer technology knowledge could get online resources from webinars, websites, and resource persons but the internet connection must be good. The resource person was considered an important person in providing teaching materials for the teachers as claimed by Teacher 1:

> *"I could get teaching resources easily from the webinar series and websites sent by the resource person. I just need to contact the resource person for additional resources" (Teacher 1).*

Teachers, especially those with better knowledge of technology shared their online materials with colleagues as indicated by Teacher 2 thus:

"*Past years' papers and course materials. I also shared materials and videos from YouTube with my colleagues."* (Teacher 2) Please check the accuracy of this correction.

Searching for materials from other sources, including other college websites was also useful to make online teaching more effective. Teacher 3 added that:

> *"There are downloadable worksheets related to my topics available on the Internet. Some colleagues also sent useful materials to my Dropbox. I can also get links and resources from other institutions teaching the same topics" (Teacher 3).*

Teachers were however selective when downloading videos to boost students' interest in certain topics as mentioned by Teacher 7 who indicated that students learn *"…learn better when using online learning resources, especially visualizations."*

The respondents believed that awareness enabled them to look for more online materials using websites provided by the colleges. The more resourceful teachers designed activities using online resources and made sure students with different abilities could understand the materials delivered online. Teacher 4 commented that:

> *"Creating more awareness among teachers on how to look for online teaching resources solves many problems because online learning resources recommended by the university also include many e-learning modules" (Teacher 4).*

4.2.5.4 Teachers should utilise alternative online assessments.

All the respondents felt the greatest challenge when teaching online was conducting online assessments. Since, the lockdown in South Africa due to the COVID-19 pandemic, social distancing and lack of non-verbal communication made assessments only possible through LMS platforms such as Moodle and Blackboard. Teacher 2 said:

> *"I conducted assessments using the standard exam rubrics. That means I'm not compromising with standards even when assessing using Skype" (Teacher 2).*

Thus, the teachers had to think of the best platforms when conducting both written and oral assessments for the students. However, it became clear to the respondents that using alternative methods meant that the content would be different from that given in the traditional classroom. Respondents were aware that each alternative assessment approach must ensure that students achieved the learning outcomes. Teacher 4 taught *"Reading Compression and posted the standard test online in the Google Classroom"*. The other common assessment used by the teachers included multiple-choice items on WhatsApp as indicated by Teacher 5 who said that they made "…*use of true-false, fill-in-the-blank and open-ended questions to get their understanding of the topic*." The same respondent indicated that *"students do their assessment and return in, E-mail for submission of assignments."* Teacher 3 considered *"multiple choices, true and false statements are good as I can give them feedback immediately. I use Google Meet to assess the group discussions."* However, giving feedback immediately after assessment also took much longer preparation time and this stressed the teachers as pointed out by Teacher 6 whose students *"always ask for feedback immediately, taking more time and it is tiring."*

4.3 Discussion

The quantitative analysis showed that ICT infrastructure availability, organisational factors as well as environmental factors have a positive influence on LMS adoption. This corroborated the qualitative results which incorporated these factors in the challenges (ICT infrastructure availability, organisational factors as well as environmental factors) and measures in the LMS adoption. It should be stressed that educational technology integration is dependent on the readiness of individual teachers (Petko et al., 2018). The successful adoption of digital technology into the curriculum relies heavily on the readiness of the teachers (Singh & Chan, 2014). This study found it important to ascertain the adoption of LMS platforms which is a promising direction in education in the post-COVID-19 period. As educational systems search for alternative approaches (Cahapay, 2020) amid the age of social distancing measures (Cahapay, 2020), colleges seem to head towards a LMS modality. The level of readiness of teachers for technology integration has been widely reported in the related research (Ref needed here: give an example of the related research). The global trend of a moderate level of teacher readiness for technology integration corroborates the quantitative results of the current study.

Furthermore, it should be noted that while this inquiry mainly focused on the construct of LMS adoption, the qualitative results inevitably and constantly probed different facilitating and hindering factors. The vast body of research highlights a complicated pattern of interconnected factors related to readiness and is expected to be a predictor of the successful integration of technology in education (Player-Koro, 2012). For example, Bingimlas (2009) found three factors that impede the readiness of teachers for LMS adoption. These are: “lack of confidence, competence, and accessibility to resources” (p.9). These factors are like the ones uncovered in this study. Koehler and Mishra (2009) further focused on experience as a factor. They argued that the inadequate experience of teachers in the application of educational technologies in education can be attributed to social and contextual factors that muddle the connection between technology and instruction. This condition does not encourage success for technology integration initiatives. Other researchers such as Goktas et al. (2013), Singh and Chan (2014), and Maimun et al., (2017) identified more specific factors that facilitate or hinder teachers from integrating technology in instructional implementation.

These factors include teacher skills, school infrastructure, budget allocation, teacher confidence, quality technical support, workload, access to technology, teacher practices, the structure of education systems, the nature of the curriculum, and the peer support system. Regarding teacher

experiences and practices, an interesting point in the present research is the inevitable discussion about the holding of teachers on the traditional modalities. While blended learning combines traditional and online modalities, teachers appear to cling to the traditional modalities. This issue is also revealed by Bingimlas (2019) who found out that in an attempt to integrate technology into classroom instruction, teachers maintained high favour for traditional techniques. All these factors mentioned were identified by Sherry and Gibson (2018) who recommended that four factors should be taken into consideration when planning to introduce technology in schools. These are technological, individual, organizational, and institutional factors. These factors, directly and indirectly, appear in the qualitative results of the current study, meaning that they should be given serious attention when developing a comprehensive program to prepare teachers for blended learning modality.

4.4 Chapter Summary

On the quantitative strand, the main topics in this chapter analysed, presented, and discussed outcomes of the surveys. Frequency tables, Pearson correlation charts, ANOVA charts, coefficient charts, and regression analyses were used to present the results. These tested the study's suggested hypotheses. Generally, organisational factors and environmental factors are positively related to LMS adoption. Qualitatively, the main themes derived from the interviews were challenges faced by schools in LMS adoption, schools' mechanisms in addressing factors limiting LMS adoption, and measures for effective LMS adoption. The quantitative and qualitative data corroborated as independent variables of the study dominated the interview themes as they influenced LMS adoption. The project's overall summary, recommendations, and conclusions are included in the next chapter.

5 CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This final chapter of the study provides a summary and conclusions of the findings, a prescription for improvement, and suggestions for future research. The research implications were drawn from the conclusion and discussion of the findings based on the study objectives.

5.2 Study Findings Conclusion

This study aimed to investigate the adoption of learning management systems by private schools during the COVID-19 pandemic in the Limpopo Province of South Africa to come up with an LMS framework that could be used by the Independent School Association of Southern Africa and other stakeholders to guide the adoption and usage of e-learning during abnormal times (when the normal pedagogy is severely challenged and disrupted) like during the COVID-19 pandemic. The following four specific objectives guided this study:

1. To determine factors affecting the adoption of LMSs by private schools in Limpopo Province during the COVID-19 pandemic.
2. To ascertain challenges being faced by schools when adopting and using LMS during the COVID-19 pandemic from a managerial perspective.
3. To establish mechanisms being taken by schools to address factors affecting learners' and teachers' capacity to adopt LMS.
4. To suggest measures that can be implemented to facilitate the effective adoption of LMS by private schools in South Africa.

Firstly, objective one addressed factors affecting LMS adoption by private schools. To facilitate the process of data collection and analysis, and address the research objective, the following hypotheses were tested in this study, and they were all accepted:

Table 5-1: Hypothesis Test Summary

	Hypothesis	**Status**
H_1	ICT infrastructure availability has a significant impact on the adoption of LMSs	Accepted

H_2	Positive Organisational factors have a significant impact on the adoption of LMSs	Accepted
H_3	Positive environmental factors have a significant impact on the adoption of LMSs	Accepted

The summarized study regression outcome model can be applied as follows:

- Holding all other factors constant, the value of adoption of LMSs will increase by about 0.029 for a unit increase in ICT infrastructure availability.
- Holding all other factors constant, the value of adopting LMSs will increase by about 0.831 for a unit increase in positive organisational factors.
- Holding all other factors constant, the value of adopting LMSs will increase by about 0.49 for a unit increase in positive environmental factors.
- Holding all other factors constant, the value of LMS adoption is 1.748 when all the independent variables have a zero value.

Overall, the summary of the hypothesis tests above indicates that there is a positive correlation between variables of ICT infrastructure availability, positive organizational factors, positive environmental factors and LMS adoption. Hence, the study concludes that improving ICT infrastructural factors like internet connectivity, software usability, and hardware availability increases the chances of LMS adoption. In addition, positive organizational factors like good administration, implementation, financial and time management have a progressive influence on LMS adoption. Environmental factors like stakeholder participation, parents' involvement, and techno-culture positively impact LMS adoption.

The second objective focused on challenges faced by schools in adopting and using LMS during the COVID-19 pandemic from a managerial perspective. The challenges faced by schools in adopting learning management systems (LMS) varied from institution to institution. The study concludes that teachers lacked preparedness. Teachers and administrative staff lacked the training and support to utilize LMS effectively. This includes understanding the features, functionalities, and best practices associated with the system. Lack of training made it difficult for educators to leverage the potential of LMS. The LMS users, including learners and teachers, approached the LMSs with an attitude.

Like any new technology, there was resistance by educators, administrators, and even students to change. Some teachers preferred traditional teaching methods and were hesitant to embrace an LMS. Overcoming this resistance through awareness, training, and showcasing the benefits of an LMS is crucial. It was found that some private schools faced challenges in terms of having adequate hardware, software, and internet connectivity to support the adoption and functionality of an LMS. The study concludes that limited resources and technical expertise can hinder the smooth adoption of these systems. Implementing an LMS can involve significant financial investments, including licensing fees, hardware upgrades, and ongoing maintenance costs. Thus, the study also concludes that schools need to consider the long-term sustainability of the LMS, including regular updates, technical support, and user training.

The third objective focused on mechanisms used by private schools to address factors that affect learners' and teachers' capacity to adopt learning management systems. The study found that some schools provide ongoing training and professional development opportunities for teachers to enhance their digital skills and familiarize them with learning management systems. The study concludes that this helped the teachers to feel more confident and equipped to incorporate technology into their teaching practices. The study revealed that schools offered technical support to teachers and students to troubleshoot any issues they encountered while using learning management systems. This ensures smooth functionality and minimizes frustration or obstacles that may hinder adoption.

Lastly, the fourth objective focused on measures that can be implemented to facilitate the effective adoption of LMS. The study revealed that schools should encourage teachers to collaborate and share best practices with their colleagues who have successfully integrated learning management systems. This peer collaboration provides a supportive environment for sharing ideas, strategies, and lessons learned, thus supporting the adoption process. In addition, private schools should recognize that learners may face barriers in utilizing learning management systems. They should provide necessary resources such as user guides, tutorials, and technical assistance, to ensure students can access and navigate the platforms effectively. Also, establishing open lines of communication between teachers, students, and administrators addresses any concerns or challenges related to learning management systems. Feedback mechanisms like surveys or focus groups allow stakeholders to provide input and guide future improvements. Moreover, schools may adopt a phased approach to implementing learning management systems, gradually introducing different features and functionalities. This

staggered approach allows learners and teachers to become acquainted with the system at a manageable pace, reducing resistance to change. By implementing these mechanisms, schools strive to create a supportive environment that fosters the successful adoption and utilization of learning management systems by both learners and teachers.

5.3 Recommendations for Policy

The COVID-19 pandemic forced many educational institutions to adopt remote learning solutions, and a learning management system (LMS) can be a valuable tool for managing online courses. Here are some recommendations for adopting an LMS during the pandemic:

1. Consider the needs of the institution

Every institution has specific needs, hence choosing an LMS that meets those needs is important. A school should consider factors such as the size of its institution, the number of students and faculty, the subjects they teach, and the technological infrastructure they have in place. Specific requirements and goals for implementing an LMS should be determined.

2. Choose a user-friendly platform

An LMS that is easy to use will help to ensure that both faculty and students can navigate the platform with ease. The interface should be intuitive, and training should be provided to ensure that everyone can use the platform effectively. Hence, schools should explore different LMS options available in the market and choose the one that best aligns with their institution's needs. It is important to look for features like ease of use, scalability, mobile compatibility, communication tools, and content management capabilities.

3. Ensure the LMS is scalable

The LMS should be able to scale up or down as the number of students and courses changes. This will ensure the platform can handle the increased demand during the pandemic. The chosen LMS should be accessible to all students, including those with disabilities. Consider features like closed captioning, screen reader compatibility, and other accessibility tools to provide an inclusive learning environment.

4. Provide technical support

Technical support should be available to students and faculty whenever they need it. This will help ensure that any issues are resolved quickly and without disrupting the learning process. Offer training sessions and resources ensures that educators, administrators, and students can effectively navigate and utilize the LMS. This includes tutorials, webinars, and ongoing support to address any technical or instructional issues.

5. Encourage engagement

An LMS can facilitate communication and collaboration between students and faculty. Encourage the use of discussion forums, chat rooms, and other interactive features to help keep students engaged and motivated. Inform students about the new LMS, its features, and how it will be used for online learning. Provide clear instructions and guidelines for accessing and navigating the system. Channels for students to seek support and address any concerns should be established. Schools should encourage interaction and community-building within the LMS platform by utilizing discussion boards, virtual classrooms, and collaborative tools to promote engagement and social connection among students and faculty. Faculty members should be involved in the decision-making process and should be provided with training and support to effectively integrate the LMS into their teaching practices. Encourage collaboration and sharing of best practices among faculty members.

6. Consider data privacy and security

When adopting an LMS, it important to consider data privacy and security. It is important to ensure that ensure that the platform meets your institution's security requirements and that all users are aware of their responsibilities regarding data privacy. Prioritize the security and privacy of students and faculty data within the LMS. Implement necessary safeguards and compliance measures to protect sensitive information.

7. Monitor usage and performance

Regularly monitor usage and performance to ensure that the LMS meets your institution's needs. This helps to identify any issues or areas for improvement. Regularly assess the usage and effectiveness of the LMS through data analytics and feedback from both students and faculty. Use this information to make necessary improvements and adjustments to enhance the learning experience. Stay updated on emerging technologies, pedagogical innovations, and best practices related to online learning.

Continuously evaluate and enhance the LMS to meet evolving needs and ensure a seamless learning experience for all.

5.4 Contributions of the Study

The COVID-19 pandemic has had a significant impact on education, and many schools and universities have had to turn to online learning to continue teaching during the pandemic. This has led to an increased use of learning management systems (LMS) to deliver online learning. This study on the use of LMS in the COVID-19 pandemic can contribute to theoretical knowledge and practice in several ways as discussed below.

5.4.1 Understanding Adoption Patterns

This study provided an understanding of how, why, and when private schools adopted LMS during the pandemic. It investigated factors that influenced the decision to adopt a particular LMS, such as the cost, technical support, user-friendliness, customization options, and features offered by the system. This understanding can be beneficial to both educational institutions considering LMS adoption and software developers designing these systems.

5.4.2 Identifying Challenges and Barriers

The adoption of an LMS can present various challenges, both predictable and unforeseen. These challenges as raised in this study range from technical issues, like lack of adequate infrastructure and internet connectivity, to pedagogical concerns, such as the difficulty of redesigning courses for online delivery. The study also explored challenges related to user acceptance, such as resistance from teachers or students due to lack of digital literacy or comfort with technology.

5.4.3 Assessing Impact on Teaching and Learning

The study contributed to the understanding of how the adoption of LMS impacts the process of teaching and learning. It explored the changes in teaching methodologies, student engagement, assessment strategies, and learning outcomes. It investigated how the LMS was utilized to facilitate interaction, collaboration, and communication among teachers, students, and parents.

5.4.4 Providing Practical Recommendations

Based on these findings, the study offered practical recommendations for different stakeholders. For schools, this could include best practices for LMS adoption, strategies for training and support, and advice on selecting an appropriate LMS. For policymakers, the study could inform decisions regarding funding, infrastructure development, and regulations for online learning. For LMS vendors,

the findings could provide insights about user needs and preferences, guiding them to enhance their systems.

5.4.5 Promoting Digital Literacy

By exploring the experiences of teachers and students in using an LMS, the study provided valuable insights into the digital literacy skills required to effectively use such systems. These findings could contribute to the development of training programs and resources to enhance digital literacy among educators and students.

5.4.6 Policy Implications

The study has significant implications for educational policy. Policymakers could use the findings to make informed decisions about technological integration in education, such as providing support for schools in LMS adoption, developing guidelines for online learning, and ensuring access and equity in digital education.

5.4.7 Setting Future Research Directions

The study identified areas that need further research, such as particular challenges in LMS adoption, the long-term effects of LMS use on education, or the comparative effectiveness of different LMSs. It could also provide a valuable foundation for longitudinal studies tracking the effects of LMS adoption over time.

5.4.8 Influence on LMS Vendors

The feedback and experiences collected during the study can significantly influence how LMS vendors develop and improve their products. They can use this information to address identified shortcomings, improve user interface and experience, and introduce features that better serve the needs of educational institutions.

5.4.9 Global Education Landscape

By understanding how private schools adapted to the pandemic by adopting LMS, the study can contribute to a broader understanding of the global education landscape during this challenging period. It can provide insights into how educational institutions can adapt and innovate in response to crises, which can be valuable in future scenarios.

Overall, the study can contribute to both theoretical knowledge and practical applications by exploring the benefits and challenges of using technology for online learning during a crisis, and by providing recommendations for the effective use of LMS in online learning environments.

4.5 Limitations of the Study and Future Research

This study has a limited sample size that could render the results of the study not to be a true representation of the construct under study. The study sample was primarily students in Limpopo private schools, thereby excluding the extrapolation of findings to government and council schools. The fact that the study was limited to Limpopo Province may limit the generalizability of these findings to other geographic locations. Further assessment studies adopting a parallel mixed-method research design employed in the future are highly recommended. Researchers should emphasize addressing the weaknesses found in the data collection techniques and sample size in the current study. It would also be necessary to conduct this study from the perspective of other stakeholders such as parents and administrators to ensure that the voices of all are heard and taken into consideration as decisions and progress are made with this new technology. These studies could examine how to develop specific teaching strategies for creating, modifying, and individualizing highly effective lessons for online delivery, communicating with and managing students effectively at a distance and defining best practices for creating structure and efficient organization of an online classroom.

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Appendix 1: Participant Letter of Information and Consent Letter

PARTICIPANT LETTER OF INFORMATION

My name is **TICHARWA BEAULAR LILIAN**, a postgraduate student doing Master of Commerce in Business Information Systems at the University of Venda in South Africa. I am currently conducting a study entitled: "**The adoption of learning management systems by private Colleges during the Covid-19 pandemic in South Africa: A case of Limpopo Province**". This study is aimed at investigating the adoption of learning management systems by private schools during the Covid-19 pandemic in the Limpopo Province of South Africa with an aim of proposing an LMS framework, that could be used by the Department of Basic Education and other stakeholders to guide the adoption and usage of e-learning during abnormal times (when the normal pedagogy is severely challenged and disrupted) like the covid-19 pandemic. I am therefore kindly inviting you to participate in this study as a respondent.

The following ethical conditions and procedures (together with those in the consent letter below) will be followed: permission to conduct this study was sought from the University of Venda Ethical Committee; a consent letter will be presented to all participants to this study, who are required to familiarise themselves with the scope and purpose of the study and their rights before participation. Also, note that your participation in this study is voluntary and valuable to its successful completion. Please note that this is academic research and that there are no financial rewards for participation. Should you feel that you are unable to continue for some reasons, you may withdraw at any time. The data being collected is anonymous and will be treated with high degree of confidentiality. Before

using any data collection instrument like cameras for taking photographs, capturing videos and audio of participants during interviews, your permission to use such devices is kindly requested in advance. All data being collected contributes towards the right-up of the final dissertation and will be presentment generically and anonymously.

If you agree to participate, please answer the research questions on the questionnaire. On average this questionnaire will take between 15-20 minutes to completion.

I thank you for your participation in this study and marking it a success.

If you have any concerns you are free to contact myself or my research supervisor on the details bellow:

Researcher name: Ticharwa Beaular Lilia
Email: byuticha@gmail.com
Phone: +27 83 964 1943

Research Supervisor: Dr W. Munyoka
Email: Willard.munyoka@univen.ac.za

Research Co-Supervisor: Mr S Madzvamuse

Appendix 2: Consent Letter

Statement of Agreement to Participate in the Research Study:

- I……hereby confirm that I have been informed by the researcher, **TICHARWA BEAULAR LILIAN,** about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my gender, age and level of education will be anonymously processed in the dissertation.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerized system by the researcher.
- I am free at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during this research which may relate to my participation will be made available to me on request.

Full Name of Participant Date Time Signature

I, ……. …… …… ……..

TICHARWA BEAULAR LILIAN, herewith confirm that the above participant has been fully Informed about the nature, conduct and risks of the above study.

Full Name of Researcher …… Date……. Signature……

Full Name of Witness (If applicable) ……Date…… Signature……

Full Name of Legal Guardian (If applicable) ……Date…… Signature……

Appendix 3: Questionnaire

This questionnaire comprises questions about **The adoption of learning management systems (LMSs) by private schools during the Covid-19 pandemic in South Africa: A case of Limpopo Province**

SECTION A: DEMOGRAPHIC INFORMATION OF STUDENT

1. What is your age?

Age	Tick
15 years	
16 years	
17 years	
18 years and above	

2. What is your gender?

GENDER	Tick
Female	
Male	

3. What is your grade?

Grade	Tick
Grade 10	
Grade 11	
Grade 12	
Grade 13	

4. Which LMS are using at your school?

LMS System	Tick
Blackboard	
Moodle	
Google Classroom	
Other (Specify)_____	

SECTION B: ADOPTION OF LEARNING MANAGEMENT SYSTEMS

Instructions

- There is no wrong answer; each response will be treated as a correct one. Your opinion is what is required in this study.
- Do not think too long about each statement. It should take you around 10 minutes to complete.
- For each statement, put a tick (√) to show your level of agreement; **Strongly Disagree**, **Disagree**, **Agree,** and

Strongly Agree. Do not tick across two boxes.

	Statement	Strongly Disagree	Disagree	Agree	Strongly Agree
	ICT infrastructure availability (Internet Connectivity, Software Usability, Hardware Availability, Speed etc.)				
1	Materials for learning through LMS are readily available				
2	I have a device to engage LMS learning				
3	I have a good internet connection				
4	Data/ Wi-Fi for the internet is available and affordable				
	Organizational factors (Administration _ Staff skills, experience and capacitation, Implementation, Financial, Time Management etc.)				

1	E-learning is very economical for educational institutions to adopt.				
2	There is adequate ICT support				
3	My institution has enough teaching-learning resources to carry out e-learning				
4	My teachers have the technical skills to adequately take us through the LMS lessons				
	Environmental Factors (Stakeholder Participation, Peers & Parents' Involvement, Culture etc.)				
1	My parents/guardians have supported me in embracing e-learning				
2	I get motivation from my peers to know more features on LMS				
3	LMS is boring and unengaging				
4	E-learning increases learners' social isolation.				
	LMS Adoption				
1	I prefer using a computer to do my lessons.				
2	I believe using e-learning technologies will improve my exam performance				
3	Computers make work more interesting.				
4	Using e-learning technologies will allow me to accomplish more work than would otherwise be possible				
5	LMS provide me with better learning opportunities than traditional means of learning				

THANK YOU

Appendix 4: Interview Guide Questions

These in-depth key informant interviews were conducted with teachers

DEMOGRAPHIC QUESTIONS

1. How long have you been a teacher at the college?
2. What subject area(s) do you teach?
3. How long have you been using LMSs at the college?
4. Did you receive any training for the usage of LMSs?

INTERVIEW SESSION

1. The institution introduced blended learning as a strategy to increase student achievement. Based on your years of experience teaching in a face-to-face environment - what are the major differences (if any) experienced in terms of students' academic achievement between the traditional and online environments?
2. Consider your experiences in teaching in an LMS environment - what challenges did you encountering so far?
3. Following up on your responses to the above question, how did you incorporate technology with your face-to-face instruction to sustain student learning outcomes and achievements?
4. What resources did you use to infuse LMS across the curriculum?
5. Please describe how the implementation of LMS cultivated an environment that delivered higher interaction and collaboration between you and your students.
6. What skills are required to implement an LMS Class? Do you think you have the necessary skills to adoption LMSs in classes effectively?
7. What teaching strategies did you use to integrate LMS across your curriculum?
8. What roles did you play during the process of moving from traditional types of teaching and LMS learning instruction and assessment?
9. What are your perceptions of LMS as implemented at private colleges?

Probe: Describe what can be done to implement LMS effectively?

10. What are the processes and practices you implemented in your LMS, to positively affect student performance?

Probe: What suggestions would you recommend for improving the program to achieve its objectives?

11. Describe the support systems in place from administrators and government in promoting development and capacitation of LMSs throughout the curriculum.

Probe: What types of support systems do you think you will require in order to use best practices and processes for improving student performance in LMSs?

INTERVIEW CONCLUSION

1. Is there anything else regarding use of resources in preparing or conducting your courses that you would like to add?
2. Would you be willing to be contacted with follow up questions?
3. Would you be willing to be contacted about providing feedback on the data analysis?

Thank you for participating in the interview. Please feel free to contact me with any further questions.

POST INTERVIEW

Comments and/or Observations

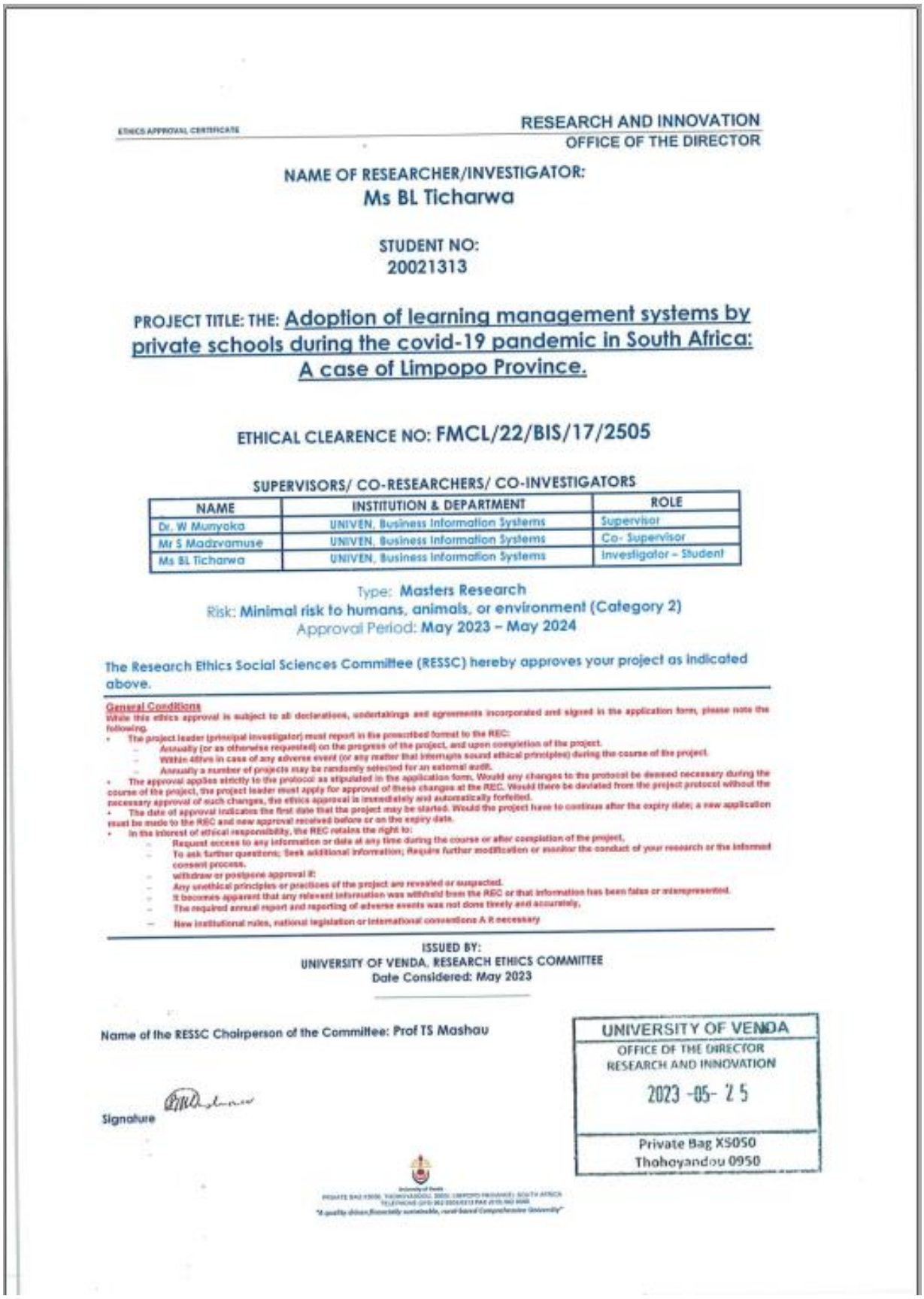
Thank you for participating in the interview. Please feel free to contact me with any further questions.

In this part of the interview, I will take a moment to:

- reflect on any observations.
- clarify on other parts of the processes that are unclear.

After the interview and observation session, I will enter notes of my impressions and other interesting things I would like to share with the Data Analysis.

Appendix 5: Ethical Clearance Certificate



ETHICS APPROVAL CERTIFICATE

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Ms BL Ticharwa

STUDENT NO:
20021313

PROJECT TITLE: THE: Adoption of learning management systems by private schools during the covid-19 pandemic in South Africa: A case of Limpopo Province.

ETHICAL CLEARENCE NO: FMCL/22/BIS/17/2505

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Dr. W Munyaka	UNIVEN, Business Information Systems	Supervisor
Mr S Madzvamuse	UNIVEN, Business Information Systems	Co- Supervisor
Ms BL Ticharwa	UNIVEN, Business Information Systems	Investigator – Student

Type: Masters Research
Risk: Minimal risk to humans, animals, or environment (Category 2)
Approval Period: May 2023 – May 2024

The Research Ethics Social Sciences Committee (RESSC) hereby approves your project as indicated above.

General Conditions
While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following.

- The project leader (principal investigator) must report in the prescribed format to the REC:
  - Annually (or as otherwise requested) on the progress of the project, and upon completion of the project.
  - Within 48hrs in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.
  - Annually a number of projects may be randomly selected for an external audit.
- The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the REC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.
- The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date; a new application must be made to the REC and new approval received before or on the expiry date.
- In the interest of ethical responsibility, the REC retains the right to:
  - Request access to any information or data at any time during the course or after completion of the project.
  - To ask further questions; Seek additional information; Require further modification or monitor the conduct of your research or the informed consent process.
  - withdraw or postpone approval if:
  - Any unethical principles or practices of the project are revealed or suspected.
  - It becomes apparent that any relevant information was withheld from the REC or that information has been false or misrepresented.
  - The required annual report and reporting of adverse events was not done timely and accurately.
  - New institutional rules, national legislation or international conventions A it necessary

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE
Date Considered: May 2023

Name of the RESSC Chairperson of the Committee: Prof TS Mashau

Signature

UNIVERSITY OF VENDA
OFFICE OF THE DIRECTOR
RESEARCH AND INNOVATION
2023 -05- 25
Private Bag X5050
Thohoyandou 0950

Appendix 6: Editing Letter

FACULTY OF HUMANITIES, SOCIAL SCIENCES AND EDUCATION

30 NOVEMBER 2023

TO WHOM IT MAY CONCERN

RE: EDITING OF MASTERS DISSERTATION TITLED "THE ADOPTION OF LEARNING MANAGEMENT SYSTEMS BY PRIVATE SCHOOLS DURING THE COVID-19 PANDEMIC IN SOUTH AFRICA: A CASE OF LIMPOPO PROVINCE

CANDIDATE NAME: TICHARWA BEUALAR LILIAN
STUDENT NUMBER: 20021313: UNIVERSITY OF VENDA

This letter serves to confirm that I edited the article titled "**THE ADOPTION OF LEARNING MANAGEMENT SYSTEMS BY PRIVATE SCHOOLS DURING THE COVID-19 PANDEMIC IN SOUTH AFRICA: A CASE OF LIMPOPO PROVINCE**"

My work entailed identifying and correcting grammatical, typographical, formatting and related editorial errors in the document.

I have recommended numerous corrections related to formatting, grammatical, typographical and sentence construction and syntactic errors in the document. The responsibility to ensure that **ALL** the recommended changes are correctly effected is that of the author of the document.

Should there be any queries regarding the editorial aspects of the document please do not hesitate to contact me.

Yours sincerely

PROF T. CHARI (PhD Wits, MA, UZ), Associate Professor, Department of English, Media Studies and Linguistics
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