UNIVERSITY OF ZULULAND

Pre-Service Teachers' Acceptance of Learning Management Systems

Submitted by

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DECLARATION

I hereby declare that I am the sole author of this thesis, and I have not submitted it to any other university for a qualification. This is a true copy of the thesis, including the required final revisions, as recommended by my supervisor and examiners. All sources I have used, or quoted, have been indicated and acknowledged as complete references. I understand that my thesis may be made electronically available to the public.

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DEDICATION

To Loveness, Tatenda, and Takudzwa, with love.

Be inspired.

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I take this opportunity to thank God for allowing me to see this work through. It was not easy but He gave me strength when I needed it most, and a clean bill of health throughout the journey. You made me believe that I can. Here below are the angels He sent to support me on this tumultuous journey and I sincerely appreciate them.

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ABSTRACT

Due to increased human and infrastructural requirements, face-to-face instruction in higher education institutions is now stretched and mostly very expensive. Most institutions are now exploring the possibility of large-scale online learning, which has been accelerated by the restrictions imposed by the Covid-19 pandemic. This study aimed to examine the factors that affect pre-service teachers' (PSTs) acceptance and the continued use of the Moodle learning management system (MLMS) in the context of a South African rural university.

To understand the phenomena under study, a model with 11 constructs was designed, underpinned by the technology acceptance model (TAM), and analysed using partial least squares structural equation modelling. The model was divided into three parts: external variables to the TAM (three factors), the TAM itself (five factors), and continued use variables (three factors).

The study followed a quantitative design, for which data were gathered using a five-point Likert scale questionnaire, with items whose responses ranged from 1 - strongly agree, to 5 - strongly disagree, developed by the researcher in consultation with previous studies. A stratified sample of 325 PSTs, selected from a population of 3 250, participated in the study. A total of 252 respondents successfully completed and returned the questionnaires, giving a comprehensive return rate of 77.5%. Descriptive statistics from SPSS version 25 were used to analyse the demographic data, while SmartPLS version 3 was used to analyse the measurement and structural models of the study.

The results showed that the six variables identified to explain PSTs' acceptance of the MLMS were statistically accepted and that they combined to explain a substantive 66.9% of the variance in pre-service teachers' behavioural intention to use Moodle, which in turn explained a notable 48.9% of the variance in actual use of the MLMS. Actual use of the system also explained 30.7% of the variance in PSTs' confidence and 35.2% in preparedness. These results showed that users were moving positively in embracing the use of the MLMS.

The overall model showed that all 10 explanatory variables explained 66.5% of the total variance in continued use. This means that the model is a good predictor of the

factors that PSTs consider in their acceptance and continued use of the MLMS. Lastly, the moderation results showed that demographic variables do not influence pre-service teachers' continued use of the MLMS.

Empirical evidence from this study showed that the developed model is statistically valid and robust. It is recommended for use by stakeholders. PSTs are, therefore, encouraged to fortify their use of the MLMS as they seek success in their studies. Future research could be conducted to establish the 33.5% of factors not captured in this model. Further studies are also encouraged to use a qualitative approach that explores a deeper meaning into why respondents' demographics failed to moderate between actual use of the MLMS and its continued use.

KEYWORDS: Actual use, Continued use, Moodle learning management system, Technology acceptance model, Pre-service teachers.

LIST OF ABBREVIATIONS

ATT	Perceived Attitude Towards
BI	Behavioural Intention to Use
CA	Cronbach's Alpha
CB-SEM	Covariance Based Structural Equation Modeling
CON	Confidence to Use
CR	Composite Reliability
CSE	Computer Self-Efficacy
CU	Continued Use
DBE	Department of Basic Education
DHET	Department of Higher Education and Training
HEI	Higher Education Institution
ICT	Information and Communications Technology
LMS	Learning Management System
MLMS	Moodle Learning Management System
MOODLE	Modular Object-Orientated Dynamic Learning Environment
MSTE	Mathematics Science and Technology Education
PEOU	Perceived Ease of Use
PLS	Partial Least Squares
PLS-SEM	Partial Least Squares Structural Equation Modeling
PPD	Preparedness to Use
PR	Perceived Resources
PSTs	Pre-service teachers
PU	Perceived Usefulness

SARUTAM..... South Africa Rural Technology Acceptance Model

SEM ..... Structural Equation Modeling

SN ..... Subjective Norm

SPSS..... Statistical Package for Social Sciences

TAM..... Technology Acceptance Model

UNIZULU..... University of Zululand

VIF..... Variance Inflation Factor

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CHAPTER ONE

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 Introduction

The advent of technology brought relief to people experiencing many challenges across all levels of society. Technology refers to the systems, methods, and devices that are a result of scientific knowledge applied to practical purposes (Shalf, 2020). Humankind has witnessed the growth of technology stretching back from the stone age, through to the industrial revolution, and into the 21st century. The world is now in the fourth industrial revolution, and technology is changing at an unprecedented rate, to the extent that without the proper technology in place, one risks being left behind (Kumar Basak et al., 2018; Okyere-Kwakye et al., 2016). This is true for all nations and for all sectors of the world economy, the education sector included.

Globally, education has equally seen tremendous technological changes. As an enabler, facilitator, and innovative tool, new technology has influenced education at all levels, including early childhood, secondary education and higher education, globally (Kahveci et al., 2011; Okyere-Kwakye et al., 2016). Educational institutions are now obliged to re-invent and move away from solely using traditional teaching and learning methods to embrace blended learning, where teaching and learning now incorporates new educational technologies. The need for modern virtual learning management systems has been fortified by the need for social distancing in the face of the catastrophic and fatal SARS-CoV-2 (commonly known as Covid-19) pandemic of 2020 (Deng et al., 2020; Petropoulos & Makridakis, 2020).

The outbreak of Covid-19 has strengthened the need for innovative non-contact teaching methods, such as those advocated by the connectivism theory (Downes, 2005; Siemens, 2004). The Covid-19 virus, considered the world's worst public health threat since the 1918 influenza pandemic (Greenstone & Nigam, 2020), is believed to be spread by infected people coming into contact with non-infected people. The pandemic has significantly affected human life and interaction, with record numbers of sick and dead around the globe. To combat the spread of the virus, health practitioners have recommended frequent sanitisation, healthy eating, exercising regularly, and practising social distancing. Studies have shown that countries that practice stringent

social distancing reduce the spread of the disease, as compared to those countries whose policies are slower and sporadic (Chang et al., 2020; Kissler et al., 2020).

Educational systems have not been spared the effect of Covid-19 and have attempted to follow health recommendations. Social distancing has now forced lecturers and their students apart, notwithstanding the need for the continuation of the academic agenda. In particular, university students must now handle several kinds of environmental, electronic and mental struggles due to Covid-19 (Al-Okaily et al., 2020; Dwivedi et al., 2020; Kapasia et al., 2020). Hence, there is a need for robust learning management systems that are capable of catering to the needs of the millions of students, lecturers, and other end users scattered around the globe.

In response to this unavoidable development, many higher education institutions (HEIs) have intensified the incorporation of teaching and learning through technology and using online platforms. Learning through new technology now includes digital learning, electronic learning and mobile learning (Kumar Basak et al., 2018). Digital learning refers to the use of technology to enhance a student's learning experience. It comprises of interactive learning resources, digital learning content, software, or simulations that engage students in academic content.

Electronic learning and mobile learning are often included with digital learning, although they are used in a complementary way to mean technological learning (Kumar Basak et al., 2018). Electronic learning involves uses of network technologies to create, foster, deliver, and facilitate learning anytime and anywhere (Ahmad et al., 2012). Electronic learning is also defined by Bencheva (2010) as a tailored approach that focuses on the individual learner, which employs activities such as virtual events, simulation, collaboration, assessment, authoring tools, group discussions, and learning management systems. The mention of learning management systems (LMSs) is notable at this point because they are the foundation of virtual teaching and learning, and hence the central subject of this study.

The advent of LMSs has eased pressure on HEIs who are faced with two opposing goals: firstly, to cut operational costs while offering quality education because, in today's economy, higher education institutions face increasing pressure to cut costs and provide customers with electronic learning platforms that satisfy their learning goals (Ćukušić et al., 2010); secondly, to provide electronic learning uses for

technology serving lifelong learning purposes. This means that pressure is also eased those who do not have easy access to traditional education due to their geographical location and socio-economic situations (Gulati, 2008). To achieve these goals, the introduction and establishment of e-learning in higher education institutions is a necessity.

Studies have underlined the importance of e-learning and e-learning tools for improving teaching and learning in higher education (Demiray, 2011; Sife et al., 2007). This process differs across countries and across higher education institutions. In the HEIs of developed countries, e-learning is common and widely used, while in developing countries it is still relatively new (Damnjanovic et al., 2015; Evans & Mutula, 2015). Developing countries and their higher education institutions are focused on establishing educational e-strategies to facilitate the transition from traditional learning to e-learning through blended learning (Maphosa et al., 2020). This process is, however, not an easy one, owing to the numerous challenges faced by HEIs in developing countries.

Studies in Nigeria (Ahmad et al., 2012; Okon et al., 2007; Olaniyi, 2006) enumerated factors that influence the digital divide. Digital divide in this study is defined by access to various aspects of information and communication technology, such as physical access, motivation, skills, and actual use of digital technologies (Soomro et al., 2020).

These factors include:

- Poor access to internet.
- Poor skills to browse.
- Inadequate financial capacity.
- Poor internet services.
- Interruption of power supply.
- Poor level of awareness.
- Poor maintenance culture of facilities.
- In appropriate ICT policies.
- Poor implementation of the policies.
- Population explosion.
- Government’s negative attitude towards rural areas.
- Inadequate government commitment to education.

- People's negative attitude towards technology.

These types of challenges are similar in all developing countries, including South Africa (Chewe & Chitumbo, 2012; Mpungose, 2020a; Ndlovu & Mostert, 2018). It is against this background that many studies in Africa (Coleman & Mtshazi, 2017; Mtebe, 2015; Unwin et al., 2010) were commissioned to find optimal solutions to such challenges amidst stiff competition for limited resources in their economies. The establishment of a robust learning management system, as proposed in this study, has become a welcome development for many HEIs around the globe.

Internationally, LMSs are referred to differently as e-learning systems, course management systems or even virtual learning environments (Costa et al., 2012). In these systems, students can access course content in different formats (texts, images, sounds, and videos), as well as interact with lecturers and/or colleagues, via message boards, forums, chats, video-conference or other types of communication tools (Sánchez & Hueros, 2010). These platforms offer a variety of configurable features that enable the creation of online courses, subject pages, work groups, and learning communities. (Coates et al., 2005; Costa et al., 2012; Dougiamas & Taylor, 2003). In addition to the pedagogical dimension, these systems have a set of features for registering, monitoring and evaluating the activities of students and lecturers, enabling the contents' management via the internet (Costa et al., 2012).

A good e-learning platform should provide integrated support for six different activities: creation, organisation, delivery, communication, collaboration, and assessment (Costa et al., 2012). That is a system to provide services that are necessary for handling all aspects of a course through a single, intuitive, and consistent web interface. Many scholars (Bagarukayo & Kalema, 2015; Coleman & Mtshazi, 2017; Dougiamas & Taylor, 2003; Gani, 2013; Šumak et al., 2011) enumerated such services to include:

- Course content management.
- Synchronous and asynchronous communication.
- The uploading of content.
- The return of students' work.
- Peer assessment.
- Student administration.

- The collection and organisation of students' grades.
- Online questionnaires.
- Online quizzes.
- Tracking tools, etc.
- Wikis, blogs, RSS, 3D virtual learning spaces.

Šumak et al. (2011) concluded that an e-learning system provides services to enable students to shift from passive learners to active learners, where they can actively participate in the on-line learning process. Essentially, e-learning environments provide access to synchronous and asynchronous learning resources and activities (Šumak et al., 2011).

There are several LMSs available on the market. They include ATutor, Moodle, WebCT, Learn.com, Joomla LM, Krawler LMS, and Blackboard (Abdallah et al., 2019; Ahmad et al., 2012; Fathema et al., 2015; Gani, 2013; Yakubu & Kah, 2020). Some of these are commercial (users must pay), and some of them are open source (freely available to users). Of the open source applications, Moodle is the one most used by HEIs in developing countries because it is cheaper to run and readily available. However, for an institution to use a particular LMS, the users must have a buy-in. While the adoption of any e-learning software in any traditional learning institution comes with its intrinsic challenges, the benefits that Moodle offers to its user community may outweigh these challenges.

Chewe and Chitumbo (2012) investigated the factors that would impede the process of adopting Moodle at a Zambian institution and how they could be mitigated. Further, the study attempted to establish possible strategies that could be used to make the Moodle implementation process a success. Yakubu and Kah (2020) also investigated Nigerian higher education instructors' acceptance of LMSs using structural equation modeling.

Likewise, the purpose of this study is to examine pre-service teachers' acceptance of the Moodle learning management system in the context of a South African rural university. This purpose is aimed at providing a panacea to the perennial problem of limited access to ICT resources, which normally retards teaching and learning in the face of limited resources. The study also seeks to establish pre-service teachers' confidence and preparedness to continue using the Moodle learning management

system, after acceptance. Understanding these factors could assist the university authorities in establishing a workable and optimal LMS for the institution. Since the university is rural based, it is the nearest available institution for many poor regional students who lack the financial resources to migrate to other well-resourced institutions in the country. This leads to the problem of large classes, which puts pressure on the university to hire more staff, thereby compounding the problem.

A well-synthesised and robust online learning management system, like Moodle, could help to alleviate this challenge. The online system enables one lecturer to reach out to many students at once. Hence, there is a need to ascertain the acceptance of this resource by pre-service teachers, vis-à-vis their confidence and preparedness to continue using the resource.

1.2 Background to the Study

Today's world has been transformed tremendously by the evolution of information and communication technologies (ICTs), and that has created platforms to necessitate instant communication and networking. ICTs have further revolutionised daily operations in the corporate world, social arena, and academic spaces. In academia, ICTs have made an appearance both locally and internationally, with significant changes in the way they have contributed to the academic space. Before the invention of ICTs in education, communication and consultation between lecturers and students occurred primarily by means of telephones, slow postal service ('snail mail') posts, and facsimile machines (Gani, 2013). Today, ICTs have enabled communication and consultation to take place through a variety of mediums, namely electronic mail, satellite broadcast, video conferencing, and LMSs. The latter, in particular, have brought much relief to many HEIs the world over (Foreman, 2018).

LMSs may be viewed as enterprise-wide and internet-based systems (e.g., such as Moodle and Blackboard) that integrate a wide range of pedagogical and course administration tools (Coates et al., 2005; Foreman, 2018). This means that LMSs are information systems which are accessible through the internet, offering learning, teaching, and administrative tools to assist HEIs in teaching and learning processes. Although globally many HEIs have adopted LMSs, this adoption was more successful in developed countries like the United States, Australia, Sweden, and Norway, who

use such LMSs like Blackboard/WebCT (Christie & Jurado, 2009; Falvo & Johnson, 2007). In developing countries, the adoption of LMSs has been relatively slow owing to financial constraints, except in institutions that are well-resourced and using the Sakai or Vula LMSs (Unwin et al., 2010). The less affluent African HEIs opted for open source LMSs like Moodle (Chewe & Chitumbo, 2012; Fathema et al., 2015; Yakubu & Kah, 2020).

Both nationally and internationally, HEIs have adopted LMSs. The adoption of LMSs is understandable given the high expectations placed on LMSs as tools for facilitating flexible education, student-centred methods, the creation of effective learning environments (Gibbs, 2012; Okyere-Kwakye et al., 2016), and goals appropriate for any HEI (Abdallah et al., 2019; Gani, 2013).

Despite all the benefits that may come with the use of LMSs, it must be stated that many HEIs have not managed to utilise the full potential of these information systems. Many studies concur that the communication features of LMSs are poorly utilised in most institutions, and that the LMSs are being used primarily as storage facilities for lecture notes and PowerPoint presentations or simply as information repositories (Costa et al., 2012; Dobozy & Reynolds, 2010; Lonn & Teasley, 2009; Sclater, 2008; Unwin et al., 2010).

Unwin et al. (2010, p. 7) summarised that:

> *…most e-learning in Africa focuses almost exclusively on the use of the Web to gather information and on e-mail for communicating with students; little real use seemed to be made of integrated LMSs … even amongst quite experienced users, most only actually use a relatively small number of the features available in their local LMSs.*

This observation is an anti-climax considering all the efforts to bring technology into HEIs. However, this has not dampened the efforts to employ learning management systems, researchers and governments are keen to see successes in implementation of technology in higher education (Unwin et al., 2010).

The South African government has weighed in to assist with these important information systems. The Department of Higher Education and Training (DHET) has put its weight behind the establishment of sound LMSs in HEIs (Council on Higher Education, 2013), a move also supported by the Department of Basic Education, as it looks forward to trained teachers with computer technology skills from universities'

teacher training programmes (Department of Basic Education, 2004). Consequently, the University of Zululand (UNIZULU) has been a beneficiary of the significant investments in e-learning injected by the DHET through the Teaching Development Grant (TDG) to assist in the development of a sound teaching and learning environment at the university (Evans, 2013; University of Zululand, 2018).

UNIZULU is a unique, comprehensive, rural based university in the rural northern part of the province of KwaZulu-Natal of South Africa. Its rurality is characterised by the high poverty of the rural communities around it. These are communities from which most of the students come. Comparative to other universities in the country, UNIZULU is significantly under resourced. This restricts student access and experience with technology. The lack of computing infrastructure and computer laboratories at the university, and the limited understanding of faculty at the institution as to what the effective use of technology is for faculty and students, greatly affects students' perceptions (Bayaga et al., 2021). It is, therefore, hoped that this study will assist in creating relevant awareness so that both students and faculty members can accept use of the Moodle learning management system to improve their chances of access to online resources at the institution.

UNIZULU is a traditional contact institution with four faculties, namely the Faculty of Education; Faculty of Arts; Faculty of Administration, Commerce and Law; and Faculty of Science and Agriculture. A number of e-learning projects have been initiated at the institution since 2000, ranging from basic departmental websites, which hosted virtual classrooms to the actual deployment of various learning management systems (LMSs) including: WebCT, now called Blackboard (2000); MyCMT, which was developed in-house by the Department of Accounting and Auditing (2002); and the Modular Object-Orientated Dynamic Learning Environment (Moodle), which was piloted by a staff member in the Faculty of Arts, Department of Information Studies (Evans, 2013). Moodle was officially adopted as the preferred LMS of the institution in 2009, and offered to each of the four faculties (University of Zululand, 2018, 2019).

The e-learning vision of UNIZULU is enshrined in its e-learning strategy document of 2018, which seeks to develop and empower the academic community, including students and staff, to take advantage of the opportunities offered by e-learning to improve the teaching and learning performance indicators of students (University of Zululand, 2018). This vision has specific aspirations for students which align with the

aspirations of staff and UNIZULU, as a rural based, historically disadvantaged, public, higher education institution (University of Zululand, 2018).

University of Zululand (2018) states that UNIZULU students will:

- Have an empowering, personal and technology-enhanced, learning experience to improve their academic performance indicators.
- Enjoy interaction with rich educational content via mobile devices within and beyond the physical bounds of its campuses.
- Have access to an increasing range of online, interactive, and feedback-rich learning resources available on-campus.

The University of Zululand (2018) further states that, the university undertakes to provide information technology infrastructure that:

- Supports high-speed connectivity.
- Has high physical storage and processing capacity.
- Has the capability to cater for multi-media content.

In so doing, the university intends to proceed with blended learning, an approach to learning that combines face-to-face and online learning experiences, where each of the human factor and the technology factor will complement the other. The UNIZULU blended learning model is shown in Figure 1.1 where different modes of engagement are shown. The human factor (on the left side of Figure 1.1) includes all the staff that are involved in the teaching and learning process, while the technology factor (on the top side of Figure 1.1) includes all the digital learning (Kumar Basak et al., 2018). Central to online learning is the learning management system (at the bottom of Figure 1.1). As stated earlier in this chapter, the chosen LMS at UNIZULU is the open source Moodle (on the right side of Figure 1.1).

Figure 1.1: UNIZULU blended learning model (University of Zululand, 2018, p. 20)

From the preceding background (sections 1.1 and 1.2), it emerges that higher education institutions across the globe, UNIZULU included, have at least an intention to adopt learning management systems to manage their teaching and learning activities. It has also emerged that LMSs are underutilised, especially in developing countries. There appears to be not much effort being made to take full advantage of the interactive tools that LMSs have to offer.

At UNIZULU, where the researcher of this study is currently employed as a lecturer, the researcher has gathered, through own experience and informally from colleagues that students only use the quiz, file and assignment resources of the Moodle LMS, which amounts to about 13% only of the available resources on the platform (three resources are utilised out of the 22 available on the UNIZULU Moodle). This is a real cause for concern. The question is why have institutions that have adopted LMSs end up underutilising them? One realisation is that the adoption of an LMS is more on the administrative side of the institution, while its acceptance is more on the user side. For an LMS to be accepted, it must have the buy-in of its users (Davis, 1993; Venkatesh, 2000).

The literature reviewed (Chewe & Chitumbo, 2012; Claar et al., 2014; Venkatesh & Davis, 2000; Yakubu & Kah, 2020) has provided proof of the research conducted on the adoption and acceptance of LMSs, but there does not seem to be much research available on the factors affecting pre-service teachers' acceptance of the Moodle learning management system. There also does not seem to be any research concerning pre-service teachers' confidence and preparedness to continue using the resource after their acceptance. It is anticipated that this study will help to fill these gaps and provide insight into the full utilisation of LMSs in the context of rural universities.

1.3 Theoretical Framework

The theoretical framework underpinning this study is the extended technology acceptance model (TAM). A theoretical framework is a collection of interrelated concepts that guide research, determining what phenomena will be measured and what statistical relationships will be considered (Rocco & Plakhotnik, 2009). Imenda (2014) weighed in that a theoretical framework is the application of a set of concepts drawn from the same theory, to offer an explanation for a particular phenomenon or research problem.

The TAM was proposed by (Davis, 1989) as an improvement to the theory of planned behaviour by (Ajzen & Fishbein, 1980). It is specifically meant to predict the acceptance and actual use of computer technology, and is noted as one of the most used models to explain and predict acceptance of information systems in workplaces and in academia (Venkatesh, 2000). The theory postulates that user acceptance of a given information system or technology is primarily determined by two constructs: perceived usefulness, and the perceived ease of use of the technology. Many other studies have since identified additional factors, such as attitude and behavioural intention (Damnjanovic et al., 2015; DuFrene et al., 2011; Durndell & Haag, 2002; Šumak et al., 2011). This study further extends the external factors to include subjective norm, perceived resources, and computer self-efficacy (*a priori*), as well as confidence, preparedness, and continued use (*a posteriori*).

1.4 Problem Statement

Contestations thus far have revealed that learning management systems have been adopted in many higher education institutions worldwide (Aslam et al., 2020; Claar et al., 2014; Dobozy & Reynolds, 2010; Yakubu & Kah, 2020). Numerous studies confirm the acceptance of technology worldwide (Davis, 1993; Okyere-Kwakye et al., 2016; Venkatesh & Davis, 2000). Moodle, as a LMS, was accepted in developed countries but not so much in developing countries. Numerous studies from developed countries have analysed the effectiveness of Moodle as an e-learning tool in higher education (Escobar-Rodriguez & Monge-Lozano, 2012; Martín-Blas & Serrano-Fernández, 2009; Paragina et al., 2011). For instance, the study by Escobar-Rodriguez and Monge-Lozano (2012) showed that the learning-teaching process is improved, and students obtain better skills and grades by using Moodle. Martín-Blas and Serrano-Fernández (2009) used Moodle for their course and created more appealing activities, making the learning process more friendly and interesting for their students. Using Moodle, the learning-teaching process is optimised and an effective, but flexible, learning environment for the participant is created (Paragina et al., 2011).

However, in developing countries, there are some difficulties in using Moodle, due to a lack of abilities, knowledge, and skills for its use, which reduces the positive effects of using Moodle or even outright rejects it (Damnjanovic et al., 2015). This is because developing countries lag behind in terms of technological advancement (Almarzooqi, 2016; Seck, 2012), the reasons of which are not a subject of this research.

While some studies in Africa have touched on the use of Moodle (Mtebe, 2015; Yakubu & Kah, 2020), the acceptance of such has not been rigorously investigated (Escobar-Rodriguez & Monge-Lozano, 2012; Fathema et al., 2015). Some studies have considered perceptions of students using Moodle (Maphosa et al., 2020), some with curriculum issues with respect to Moodle (Mpungose, 2020b), and some with student attitudes towards the use of Moodle (Khoza & Mpungose, 2018; Rojpibulstit et al., 2019). Unfortunately, there does not seem to be any studies dealing with pre-service teachers' acceptance of the Moodle learning management system in the context of rural universities in South Africa where ICT resources are scarce. The acceptance of the Moodle learning management system is generally affected by a number of factors in the context of rural universities. These factors include Subjective Norm, Computer Self-Efficacy, Perceived Resources, confidence, preparedness, and Continued Use.

1.5 Aim of the Study

The aim of this study is to examine the factors that affect pre-service teachers' acceptance and continued use of the Moodle learning management system in the context of a South African rural university. To meet this broad aim, the following objectives were identified.

1.6 Research Objectives

In the context of a South African rural university, this study addressed the following research objectives:

1. To examine the factors that predict pre-service teachers' acceptance of the Moodle learning management system.
2. To investigate the extent of pre-service teachers' confidence in using the Moodle learning management system.
3. To determine pre-service teachers' preparedness to use the Moodle learning management system.
4. To establish the magnitude of pre-service teachers' continued use of the Moodle learning management system.
5. To find out the role played by demographic data in pre-service teachers' continued use of the Moodle learning management system.

1.7 Research Questions

In the context of a South African rural university, the study set out to find answers to the following research questions:

1. What are the factors that affect pre-service teachers' acceptance of the Moodle learning management system?
2. What is the extent of pre-service teachers' confidence in using the Moodle learning management system?
3. Are pre-service teachers at a rural based University prepared to use the Moodle learning management system?

4. What is the magnitude of pre-service teachers' continued use of the Moodle learning management system?
5. What role does demographic data play in pre-service teachers' acceptance of the Moodle learning management system?

1.8 Research Methodology

This study used a quantitative approach. This involves the collection of quantitative data to address the study research questions. According to Saidu and Kwadan (2020), a quantitative research approach emphasises objective measurements and statistical, mathematical, or numerical analysis of data gathered through polls, questionnaires, and surveys, or by manipulating pre-existing statistical data with computational techniques.

1.8.1 Research Design

A research design, according to Bertram and Christiansen (2014), is essentially a plan of how the researcher systematically collects and analyses the data needed to answer the research questions. For this quantitative research, a five-point Likert scale questionnaire was used to collect quantitative data on pre-service teachers' views concerning the eleven constructs identified for the study. The options of the scale were: 1 - strongly agree, 2 - agree, 3 - undecided, 4 - disagree, and 5 - strongly disagree. This scale was chosen because it is the most used of the Likert scales in research; it is easier to use and it gives a better reflection of a respondent's true evaluation (Chyung et al., 2017).

1.8.2 Sampling Design

UNIZULU was the target institution, which happened to be convenient for the researcher. This was true for this study because the researcher is an employee at the institution where the study was conducted. It was therefore convenient for the researcher to use the institution as a research site.

The institution has four faculties and all pre-service teachers are enrolled in the Faculty of Education. The Faculty of Education was as a result conveniently chosen, for the same reasons stated by Etikan et al. (2016). Stratified random sampling was used to select participants from the seven departments of the Faculty of Education. Stratified

sampling is a type of sampling in which the total population is divided into smaller groups or strata, where the strata are formed based on some common characteristics in the population data (Mills & Gay, 2016; Sharma, 2017). After dividing the population into strata, the researcher randomly selected the sample proportionally, ensuring that every stratum was adequately represented (Sharma, 2017; Taherdoost, 2016).

1.8.3 Research Instrument

The research instrument used to collect data for this study was a five-point Likert scale questionnaire, whose structure was described in Section 1.8.1. This instrument was used to collect demographic information about participants, as well as their opinions on the Moodle learning management system's acceptance. Additionally, views on their confidence and preparedness to use the Moodle learning management system were also collected using this instrument. This constituted the quantitative data required for the study.

1.8.4 Validity and Reliability of the Instrument

Cronbach's alpha and the composite reliability measures were used to test for the reliability of the instrument and, hence, the model. The average variance extracted and outer loadings of construct indicators were used to assess the convergent validity of the model. The Fornell-Larcker criterion and the Heterotrait-Monotrait ratio were used to assess discriminant validity (Garson, 2016; Hair Jr et al., 2016).

1.8.5 Data Collection

Data collection is a process of collecting unprocessed information from all the relevant sources to find answers to the research problem, test the hypothesis and evaluate the outcomes (Mills & Gay, 2016; Onwuegbuzie & Combs, 2010). The Bachelor of Education students in the Faculty of Education were all eligible to participate in the study. Quantitative data were collected through a five-point Likert scale questionnaire which was administered to participants within a period of eight weeks, with the help of two research assistants.

1.8.6 Data Analysis

The process of data analysis refers to the collection, transformation, cleaning, and modelling of data with the goal of discovering the required information. The results so

obtained are communicated, suggesting conclusions, and supporting decision-making (Onwuegbuzie & Combs, 2010). All the descriptive data in this study were analysed using the Statistical Package for the Social Sciences (SPSS) software. This software was readily available to the researcher from the ICT department of the university where this study is being conducted.

To answer research questions 1, 2 and 3, partial least squares structural equation modeling (PLS-SEM) (Garson, 2016; Hair Jr et al., 2016) was employed for all the inferential statistics of the model, using the SmartPLS version 3.8.2 software.

1.8.7 Population of the Study

The population of a study refers to a group of individuals who have common characteristics that a researcher can identify and study (Creswell, 2012). The population for this study included all the Faculty of Education students from all the seven departments. Other faculties and departments at the university were not considered because they do not enrol pre-service teachers.

1.8.8 Respondents

Kumar (2018) defined a research participant, also called a research subject, as a person who participates in a research by being the target of observation for the researcher. The focus of this research was on pre-service teachers' acceptance of the Moodle learning management system, as well as their confidence and preparedness to using it. All pre-service teachers enrolled in the Faculty of Education were eligible respondents. Every year the faculty enrols about 800 Level 1 students and about 400 Postgraduate Certificate in Education (PGCE) students, although some drop out or repeat levels along the way. This translates into a population of about 3250 students in every academic calendar year. Owing to the large population, a sample size of 325 participants (10% of population) was drawn.

1.9 Scope and Delimitations of the Study

The research was conducted at the University of Zululand in KwaZulu-Natal, South Africa. It was limited to participants in the Faculty of Education only, since it was the only faculty offering pre-service teacher training in the entire institution. As a result, the external validity of the study was controlled. External validity refers to knowing

whether the findings of a study are generalisable beyond the immediate study (Sekaran & Bougie, 2016). The developed model in this study only included three constructs as a pre-extension to the TAM. Again, in ascertaining continued use of the Moodle learning management system by pre-service teachers, only two constructs were chosen: confidence and preparedness. Otherwise, the research would be too big for completion within the required time.

1.10 Intended Contribution to the Body of Knowledge

This study provided important contributions to the body of knowledge by way of examining and unpacking the factors that affect pre-service teachers' acceptance, confidence and preparedness to use the Moodle learning management system in the context of a rural university. Theoretically, the study was original in extending the TAM to develop a new and robust model to explain the factors that potentially determine the continued use of the Moodle learning management system after acceptance by its users. In most models, researchers only end by determining the factors without going further to assess continued use. Understanding the factors that affect pre-service teachers' acceptance of the Moodle learning management system will benefit students, their lecturers, and administrators to come up with all-encompassing solutions to the problems that inhibit online learning at rural institutions.

1.11 Ethical Considerations

In terms of the ethical compliance of this study, the following issues were considered:

The research was guided by the ethical considerations for dual role research (MacLean & Poole, 2010), in which the researcher had a dual role as an instructor and that of a researcher. Research on one's own students requires attention to the issues of undue influence, conflict of interest, informed consent, and privacy (Hammersley & Traianou, 2012; MacLean & Poole, 2010).

The following ethical issues related to research in one's own classroom guided the researcher:

1. In compliance with the law and standards, the researcher applied for ethical clearance from the University of Zululand Ethics Committee, for which a certificate was granted.
2. Consent by participants was given voluntarily. In this dual role study, the researcher was aware of the potential effects of undue influence on the voluntariness or consent of the participants. The participants were asked to take part in the research by way of signing a consent letter.
3. Consent was informed. The researcher provided participants with full disclosure of all information necessary for making an informed decision to participate.
4. Conflict of interest. The researcher disclosed any real potential or perceived individual conflicts of interest that could have had an impact on the research. Acting in dual or multiple roles, the researcher disclosed the nature of the conflict to the participants in the consent process.
5. Confidentiality. The researcher safeguarded information and did not misuse or wrongfully disclose it. The researcher guarded against breaches of confidentiality because this could emotionally harm the subjects and the trust relationship between the researcher and the participants.

1.12 Feasibility of the Study

The researcher has been mentored by distinguished professors in the field. As a result, the researcher had access to the required knowledge and skills needed for this study. The researcher has had access to the post graduate research fund of the university. The financial aid available via this channel has been sufficient. The time resource available to the student was also sufficient. It was therefore feasible to carry out this study within the allocated time.

1.13 Definition of Terms

Moodle, in this study, refers to a learning management platform used by students, lecturers, and administrators to create personalised learning environments. It is an acronym for “modular object-oriented dynamic learning environment”.

Pre-service teachers, also referred to as student teachers, or simply as students, in this study, are trainee teachers who are in the process of learning to become professional teachers and are usually under guidance and supervision.

Technology acceptance model in this study refers to an information system theory that models how users come to accept and use a particular technology.

The institution in this thesis refers to the University of Zululand (UNIZULU) where this study was conducted.

1.14 Preliminary Chapter Division

This research has seven chapters organised as follows:

Chapter One is the introductory chapter which discussed the motivation of the study, statement of the problem, aims of the study, research hypothesis, as well as plan of the study.

Chapter Two chronicles the review of literature. Empirical studies carried out elsewhere on the acceptance of learning management systems as well as the confidence and preparedness to use learning management systems are articulated.

Chapter Three focuses on the theoretical background of the study where the theories underpinning this study are discussed. Also outlined in this chapter is the conceptual framework of this study.

Chapter Four outlines the design and methodology of this study in detail. Also explained therein is how the data collection instruments were designed. The data collection process and the sampling methods, as well as data analysis techniques, are also detailed in this chapter.

Chapter Five contains the presentation and analysis of the results of this study.

Chapter Six records the discussion of the findings of this research.

Chapter Seven presents the conclusions and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The aim of this study was to examine pre-service teachers' acceptance and continued use of the Moodle learning management system in the context of a South African rural university. The purpose of this chapter is to review relevant empirical evidence to that effect. The empirical evidence consists of similar studies that are used to introduce and explain key concepts, as well as the context for the acceptance and continued use of the Moodle LMS. As a result, empirical evidence on the subject from other institutions in South Africa and abroad were be discussed.

This chapter also discusses the meaning, types, features, and examples of LMSs. The definition of Moodle, evidence of its global adoption, its benefits and drawbacks, as well as barriers to implementation and factors influencing its acceptance by pre-service teachers, are all discussed.

The chapter concludes with an examination of the effects of demographic factors on Moodle implementation at the university, as well as the state of Moodle in the Faculty of Education.

2.2 Learning Management Systems

A learning management system (LMS) is a useful tool that assists institutions to provide training and education programmes to employees, customers, suppliers, distributors, professional associations, military personnel, college students, and others (Nasser et al., 2011).

Foreman (2018, p. 4) defined an LMS as:

> *… a multiuser software application, usually accessed through a web browser. It helps organizations manage training events, self-paced courses, and blended learning programs. It provides automation that replaces rigorous and expensive manual work, saves time, and enables you to organise your content, data, and learners. It tracks and reports on training activity and results.*

Managing the delivery of learning programmes presents many untold challenges leading to the need for an LMS. Training events, such as classes, workshops, and seminars, must be scheduled for a specific time, specific place, and specific audience. The event may be at a physical location or a web address, as is the case with a webinar or virtual class. People must be able to enrol in the training event, and one or more lecturers must be assigned to deliver the training programme, take attendance, and issue credit for course completion (Foreman, 2018).

Self-paced training introduces its own set of challenges. Course software and other digital materials must be uploaded and published for online access. People must be able to locate and launch the course. Their work must be tracked and recorded automatically so that they can receive credit. People who exit before finishing the course must be able to resume at the point they left off. Of course, some training requires a blend of scheduled events, self-paced modules, assignments, tests, surveys, and other components (Foreman, 2018). It is understood that the need to manage and track the training programmes requires software that can handle the tasks, thereby providing the necessary information needed to improve institutional services. Therefore, organisations require strong and well established LMSs that can contribute significantly to their goals.

2.3 Types of Learning Management Systems

There are three different types of LMSs, each with its own unique features. The learning management capabilities that suit an institution's needs may be found in one or more of these three LMSs. An institution can find its optimal needs of an LMS by comparing two or all three LMSs, although they are not easily comparable due to their distinct features that are designed for different purposes altogether. LMSs can be broken down into three major categories, which are corporate LMS, academic LMS, and integrated LCMS LMS (the C in LCMS stands for content) (Foreman, 2018). The LMS categories here discussed are more about how each type of LMS is used rather than who uses it.

2.3.1 Corporate LMS

A corporate LMS is about connecting people with learning programmes. It has a catalogue of all the courses offered. Users log in to the corporate LMS to register,

complete activities, and get credit for their courses. Corporate LMS products are primarily geared toward organisations that offer relatively short courses, that may range from an hour, or less, to several days. They typically contain courses that a company's employees might need, related to sales, customer service, products, policies and procedures, soft skills, personal productivity, management and leadership, new hire orientation, regulatory compliance, and other relevant topics (Foreman, 2018). There are many corporate LMS products available, but most products are in those categories.

2.3.2 Academic LMS

An academic LMS is an online extension of, or replacement for, the classroom. It is a website where lecturers and students meet and collaborate online. Lecturers can post materials and assignments. Students can chat with the lecturer or with one another, hand in assignments, and take quizzes. Academic LMS products are primarily geared toward institutions that offer courses spanning a term or semester (Foreman, 2018). There are a numbered of academic LMS products available to institutions.

2.3.3 Integrated LCMS-LMS

An integrated LCMS-LMS provides many of the same course delivery features as a corporate LMS. It, however, also offers features not found in a corporate LMS, such as those used for developing, and/or authoring, content (Foreman, 2018). Many course developers use PC or Mac authoring tool software to create online courses. Others use an LCMS to create not just online courses, but also job aids, lecturer and student guides (Foreman, 2018). Some of the most robust LCMS products are strictly focused on content development and do not offer any of the LMS capabilities needed to deliver the content to learners. A growing number of products now offer both content creation and delivery capabilities. This type of a hybrid product is called an integrated LCMS-LMS.

A learning content management system (LCMS) is a collaborative content development environment for course developers. It has a searchable library that stores and organises digital source materials. Developers can check items out of the library to work on them and check them back in when finished. Workflows are established to manage the content development pipeline and notify developers, editors, and reviewers of actions they need to take (Foreman, 2018). Templates can be created

and used to make the appearance of content uniform throughout the learning management system.

2.4 Commercial Versus Open Source LMS Products

The three types of LMS products are available in both commercial and open source products. The key advantage of a commercial LMS is that it is fully supported by the manufacturer. If users face challenges, they have someone to call for help. The key advantage of an open source LMS is that there are no licensing costs. The resource is freely available online. This works well for institutions that are not financially well resourced, which suits most South African rural universities.

2.5 Features of Academic Learning Management Systems

The features of an academic LMS are very different from those of a corporate LMS. An academic LMS is a system for developing, managing, and delivering learning content in the context of an online classroom that replaces or augments a physical classroom (Foreman, 2018). While one or more super-administrators manage the LMS technology and grant lecturer permissions to a faculty, the primary administrators of an academic LMS are the lecturers, professors, and teachers. Super-administrators are a small group who have special privileges to access and control the system on behalf of all other users.

Academic LMS products are used in a variety of settings, including primary, secondary, and higher education; continuous adult education; government; professional associations; and business settings. In an academic setting, courses often span a semester, during which a lecturer works with a class of student cohorts through various materials, activities, assignments, and tests. In other settings, courses are more likely to be shorter but still emphasise the lecturer and cohort model.

An academic LMS is suitable for programmes that have many students who are off or on campus or both. This type of an LMS can be used to deliver virtual classes online. A lecturer can interact with students as a group or one-on-one, and students can interact with one another. Lecturers can post course materials and assignments, administer quizzes and tests, and track student progress. An academic LMS, just like

a corporate LMS, can offer features for user management, course management, and administration. The key differences lie in how these features are designed by the vendors and used by customers.

2.5.1 User Management Features

The user management features of an academic LMS include user account creation, authentication, user profiles, and roles and permissions. While all these features are also present in a corporate LMS, they are often managed differently in an academic LMS, especially in academic environments. Table 2.1 lists the key similarities and differences between the user management features of a corporate and academic LMS.

Table 2.1*:* Comparing Corporate and Academic LMS User Management Features

Feature	Similarities	Differences
User accounts	Both contain user accounts made up of a unique user ID, username, and password. When implemented in a corporate setting, both may import user accounts from a human resource management system.	Academic LMS: When implemented in an academic setting, user accounts are usually created manually by a lecturer or administrator
Authentication	Users log in with a username and password and are authenticated—that is, matched with the appropriate user account, and authorised to use the system. When implemented in a corporate setting, both often use a single sign-on to allow users to access multiple corporate systems with a single login.	Academic LMS: When implemented in an academic setting, single sign-on is usually not needed
User profile	The user profile in both is a collection of data that describes the user.	Academic LMS: The user profile also includes a personal online portfolio of the student's course materials and coursework
Permissions	Permissions to administer system features can be assigned at a granular level.	Academic LMS: Lecturers have full permissions to manage the classes they teach and can assign specific permissions to students.

Source: Adapted from Foreman (2018, p. 18)

2.5.2 Course Management Features

Managing courses in an academic LMS is very different from doing so in a corporate LMS. An academic LMS is focused on the way courses are taught in academic environments (Foreman, 2018; Nash & Rice, 2018) and it includes features to:

- Oversee lesson plans and assignments.
- Display the course syllabus, learning objectives, and schedule.
- Offer interactive activities like surveys, quizzes, and polls.
- Upload and download multimedia course materials.
- Hold web conferences.
- Send teacher-student and student-to-student messages.
- Send multimedia feedback from the lecturer to each student (audio, video, and text).
- Participate in multimedia discussion topics by posting and responding to them.
- Create student groups and collaborative workspaces for class projects and breakout sessions.

2.5.2.1 Lessons and Assignments

Lecturers can create lessons for a class. Lessons can include presentations, assignments, quizzes, and other materials and activities. Lessons can be created from the beginning or imported from another class and then modified. Lecturers can post instructions and due dates for any number of assignments, along with the materials students need to complete each assignment. Lecturers can configure the system to send email reminders to students automatically when assignment due dates are approaching or past due. Lecturers can also view and grade the work submitted by students. Similarly, students can view assignment instructions and download the materials. After completing an assignment, students can submit their work by uploading documents on the learning management system.

2.5.2.2 Syllabus, Learning Goals, and Schedule

Lecturers can publish module outlines, the learning objectives or goals for the module, and a module schedule. Students can view this information before registering and any

time after registering for the module. The module schedule is particularly useful to set students' expectations and allocate sufficient time for assignments, study, and other coursework.

2.5.2.3 Surveys, Quizzes, and Polls

Lecturers can create a quiz or survey in the system. The LMS provides a variety of question types that may include multiple choice (such as select one/select all that apply); Boolean (true/false, yes/no); matching; Likert scale; short answer; and essay (Foreman, 2018). Some products support question pools, random question ordering, question weights, and question groups.

Tests can be configured for automatic or manual scoring. Manual scoring is usually required for tests that include essay questions. Polling questions can be posted for the class at any time. After students respond to the poll, the results can be viewed with the option to share them with the students. Surveys, quizzes, and polls can be shared with other lecturers, who can also reuse or modify them for use in another class. Lecturers can run reports to view survey, quiz, and poll results for a specific course or all the courses where they are used. Item analysis reports enable lecturers to check the reliability and validity of their quizzes and surveys.

2.5.2.4 Multimedia Course Materials

Some academic LMS products provide a way for lecturers to manage their own searchable repository of course materials. The repository may be organised into files and folders and can include instructional materials in a wide variety of formats, such as text, images, audio, and video (Foreman, 2018). Lecturers can tag their materials with descriptive information and have the option to share specific materials with other lecturers.

2.5.2.5 Web Conferencing

Many academic LMS products have built-in web-conferencing capabilities. Web conferencing allows a lecturer and the students to access a common URL, sign in, and participate in an online group session. Lecturers can share their screens with students or allow a student to share their screen with the rest of the class. The mouse and keyboard control resides with the person whose screen is being shared, although lecturers have the option to establish remote control of another person's screen. Audio

communication for the web conference can occur over the phone, the internet, or both. In addition to screen sharing, web conferences include features for private and public chats, polling questions, posting web links, and more (Foreman, 2018).

Participants can view icons that indicate who is speaking, who has a hand raised, or who likes, does not like, or is confused about what is being presented. Some systems also provide a cue indicating whether the web-conferencing window is behind other windows on a student's desktop, which may mean that the student is not paying attention.

Many systems allow for recording the entire web conference, including what is viewed and what is said. The lecturer can make the recordings available as a video for later access by students who may have missed the session, or review by the class at another time, during the year or beyond. The web conferencing plugin is usually costly.

2.5.2.6 Instant Messaging

Instant messaging features enable the lecturer to communicate with students, or students to communicate with one another online. The message can be to a single student, a group of students, or the entire class. Likewise, classmates can message one another individually or in groups. These communications can be valuable in question and answer sessions, group study, and collaborative projects.

Multimedia feedback allows the lecturer to provide feedback to students in a variety of ways using different media. Many academic LMS products enable lecturers to use any combination of text, audio, and video to communicate their feedback. Some products provide optional video capture and editing equipment and tools, making it easy to use video in course materials, messaging, and feedback to students (Foreman, 2018).

2.5.2.7 Discussion Boards

Some academic LMS products offer discussion boards where lecturers and students can create topics, post and reply to one another, like one another's posts and replies, and follow a discussion or another user (Foreman, 2018; Mealor, 2016). A discussion board can be configured to be accessible to all participants in a single class or to a broader set of students who are actively using the LMS.

2.5.2.8 Student Groups and Collaborative Workspaces

Some LMS products enable lecturers to create student groups for class projects and breakout sessions. Lecturers can establish collaborative workspaces, or virtual breakout rooms, where each student group “meets” to share materials, message one another, give one another feedback, post and reply to each other’s discussions, and conduct web conferences (Foreman, 2018; Mealor, 2016). Left alone, students do not favour this plugin unless lecturers give active roles at the design stage (Foreman, 2018).

2.5.3 Administration Features

In any type of LMS, administration features are those that require special permission and are not generally accessible to students. In an academic LMS, there is one or a small group of super-administrators who manage the LMS technology and assign permissions to lecturers, but the primary, and most active, administrators of an academic LMS are lecturers, professors, and teachers (Foreman, 2018). Academic LMS administration features include class roasters and gradebooks, reports, analytics and statistics, and tools for developing courses and lessons in the system (Mealor, 2016).

2.5.3.1 Online Classrooms

Lecturers can create any number of online classrooms for the classes they offer. Each online classroom contains lessons, materials, and other resources for the class. A student can join as many classroom as is permitted by the lecturer or lecturers.

2.5.3.2 Roster and Gradebook

A student roster is a list of all the people in the class. When students log in to the system, they are able to access a list of online classes in which they are enrolled. The lecturer can use a gradebook to track attendance, assignment completion, quiz scores, and other information for each student in the roster.

2.5.3.3 Reports, Analytics, and Statistics

Foreman (2018) reported that academic LMS products provide reports on areas that help lecturers to manage their classes, such as:

- The last time each student accessed the online classroom.

- Amount of time each student spent in the online classroom.
- Student's status for an assignment.
- Student's progress in the course.
- Student's access to the course materials.
- Student's quiz and survey results and statistics.

Table 2.2 lists the features that are common across many academic LMS products

Table 2.2: Snapshot of academic LMS features

Product	Features
User Management	• User accounts • Authentication • User profiles • Permissions
Course Management	• Lessons and assignments • Course syllabus and schedules • Surveys, quizzes, and polls • Multimedia course materials • Web conferences • Messaging students • Messages among students • Discussion topics / breakout sessions
Administration	• Permissions management • Online classroom creation • Class roster and gradebook • Reports, analytics, and statistics
Reporting	• Canned reports • Student visits, time spent, and activity in the virtual class • Student assignment status and progress in the course • Survey and test results • Learning materials listings

Source: Adapted from Foreman (2018, p. 26)

2.6 Factors to Consider when Selecting an LMS

The LMS will be widely used by students, lecturers, administrators, and sometimes parents. Therefore, it must be inclusive and user friendly. The following are a few key things to consider when purchasing or choosing an LMS:

1 Mobile app access and quality.

2 Institution size and scalability.

3 Ease of use.

4 Flexibility, scalability, and performance.

2.7 Instances of Learning Management System Products

John (2019) estimated that there were more than 800 LMS vendors competing on the learning management platforms marketplace in 2019 (an increase of the 600 originally tracked in 2014). These LMS vendors ranged from global software companies to tiny cloud vendors (John, 2019). Some examples of these LMS products include Articulate Storyline, Schoology, Canvas, Google Classroom, CallidusCloud, Cornerstone OnDemand Inc, DoceboLMS, eFront (eLearning software), EthosCE, Grovo, and Growth Engineering.

In a concept paper that discussed a number of potential LMSs that can be utilised for teaching and learning processes in the context of higher education institutions, Kasim and Khalid (2016) made a comparison based on a literature review of the characteristics of a number of selected LMSs. Among other things, the authors focussed on flexibility, ease of use, accessibility and user friendliness of the LMSs. They acknowledged that there are two types of LMS platforms, namely open source platforms and commercial platforms. Open source platforms include, among others, Moodle, Sakai, and ATutor, while commercial platforms include Blackboard, SuccessFactors, and SumTotal, as a selection of the commonly used ones (Kasim & Khalid, 2016). A brief outline of each platform and its landing page is discussed.

2.7.1 Moodle

Moodle is an acronym for Modular Object-Oriented Dynamic Learning Environment. It was developed in 2001, based on the social constructionist pedagogical principle

(Dougiamas & Taylor, 2003; Kasim & Khalid, 2016; Martinez & Jagannathan, 2008). It was developed under the terms of a GNU general public license (GPL). This means that users can make any changes to the source code as long as the original license is not changed (Kalinga, 2015). The main characteristics of the Moodle platform are that it is user-friendly, easily accessible, and highly flexible. It also has a very good student management system. Moodle can easily be integrated into other computer systems. It has the ability to allow synchronous and asynchronous interaction, a personal area for draft writing and journaling, as well as managing personal and private information, and content that can be developed based on the teaching and learning needs of users (Kasim & Khalid, 2016; Martinez & Jagannathan, 2008). Figure 2.1 shows the Moodle platform's landing page.

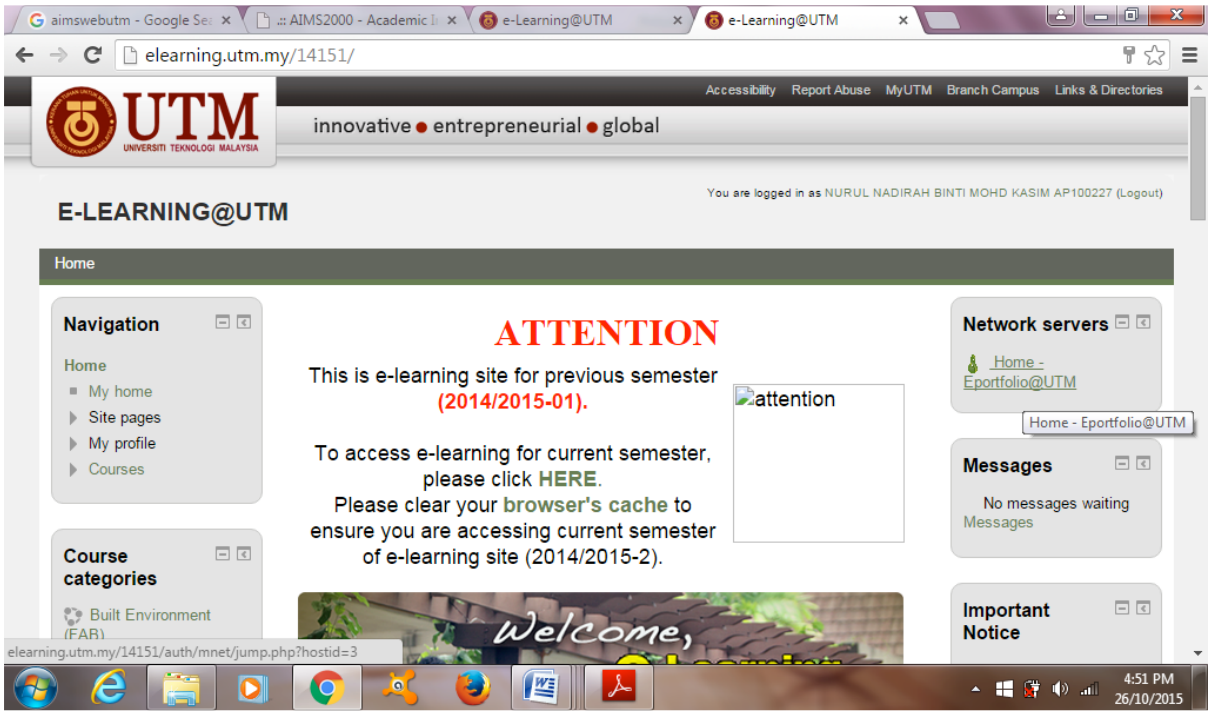

Figure 2.2: Moodle site landing page specimen (Kasim & Khalid, 2016)

2.7.2 Sakai

The Sakai platform was developed for community and LMS purposes, and the software was designed to support learning, teaching, research and cooperation (Kasim & Khalid, 2016). The software was developed in 2004 under the terms of an open source license (Caminero et al., 2013; Dube & Scott, 2014). The typical characteristics of the Sakai platform include user-friendliness, ease of use, flexibility,

and compatibility with Web 2.0 tools (Kasim & Khalid, 2016). The tools of Sakai are strengthened by a design tool for teaching and an e-portfolio. In addition, this software has been translated into more than 20 languages, allows synchronous and asynchronous interaction, and offers a personal area for draft writing and journaling, as well as managing personal and private information. Users can also send to and receive personal messages from other users. Figure 2.2 shows the landing page of the Sakai platform.

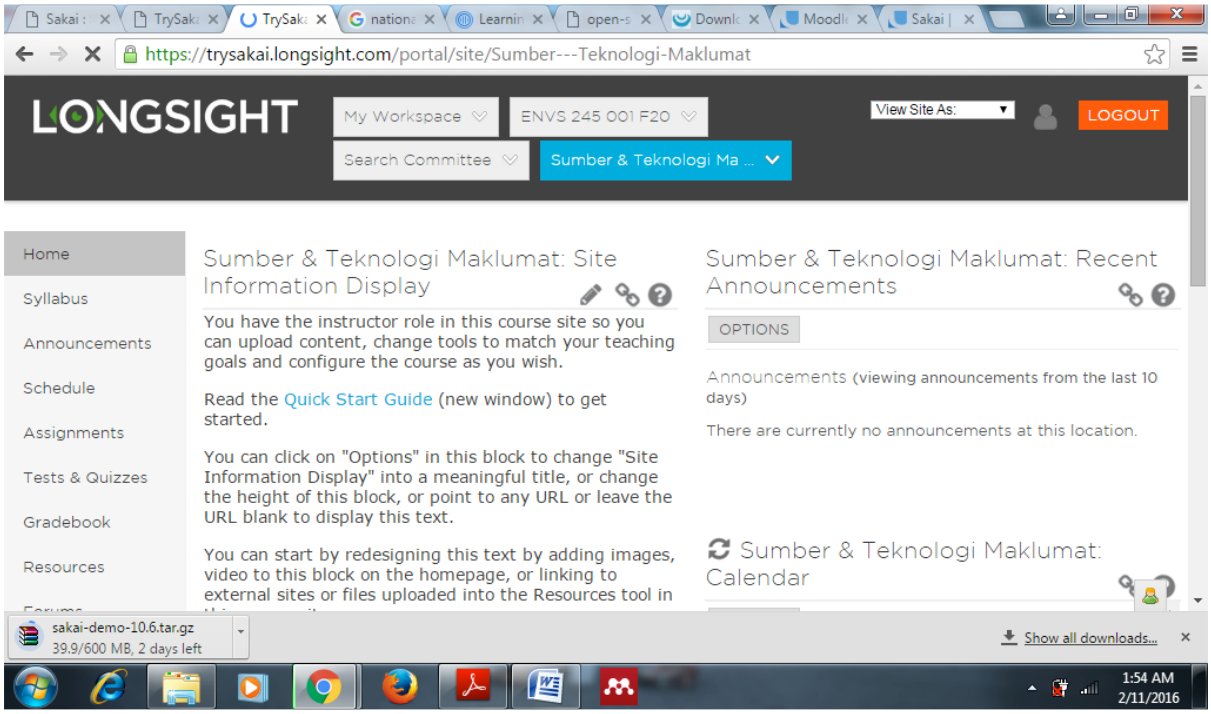

Figure 2.3: Sakai site landing page (Kasim & Khalid, 2016)

2.7.3 ATutor

The ATutor platform is an LMS that is based on open source web technology used to develop and present online courses (Assadi & Atieh, 2011; Kasim & Khalid, 2016). The leader can copy, distribute, and edit the ATutor under the public licensing conditions of a GNU general public license (GPL). The key characteristic of ATutor is its accessibility, as it ensures that users can participate in activities as students, lecturers and administrators. In addition, the use of IMS/ISO for support allows students to adapt the environment and the content to the needs of their courses (Kasim & Khalid, 2016). Lecturers and students are able to manage their ATutor courses, and users can send and receive personal messages from other users. Each user has their

own file storing utility, and this storage can be shared with other users. Thus, all the content and the course structure can be stored and backed up in ATutor. Figure 2.3 shows the landing page of the ATutor platform.

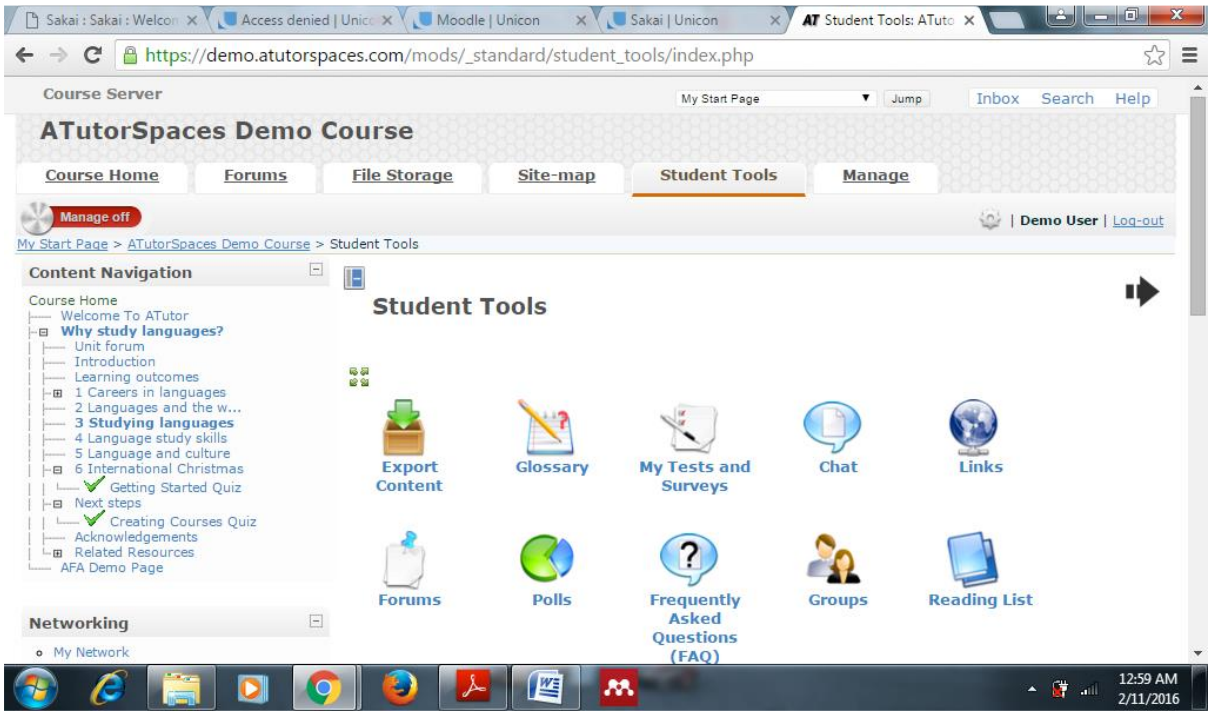

Figure 2.4: ATutor site landing page (Kasim & Khalid, 2016)

2.7.4 Blackboard

Blackboard is a commercial LMS that supports the needs of students, faculty and the institution (Kasim & Khalid, 2016). This system is licensed, meaning the institutions that use it must pay for annual license renewal. The price depends on the needs of the institution (Kasim & Khalid, 2016). If the institution requires maintenance or improvement to Blackboard, an additional cost will be charged. A major impediment of Blackboard is that it cannot be integrated with other systems (Alturki & Aldraiweesh, 2016). The Blackboard LMS system is a bit complex and expensive, but it is fully equipped with a lot of tools and services available in the Blackboard suite (Kasim & Khalid, 2016; Martin, 2008). Figure 2.4 shows Blackboard platform's landing page.

Figure 2.5: Blackboard site landing page (Kasim & Khalid, 2016)

2.7.5 SuccessFactor

SuccessFactor is another commercial platform that makes easy the development, utilisation, and management of learning courses (Kasim & Khalid, 2016). It is a cloud based system, and some of its characteristics include automatic assignment profiles, structured programmes, and elements of e-signature support over and above its flexibility. The administrator is able to restrict users' access, or give certain roles to several users depending on the course development (Kraleva et al., 2019). This system is suitable for the field of human resources (Kasim & Khalid, 2016; Kraleva et al., 2019). Figure 2.5 shows the landing page of the SuccessFactor platform.

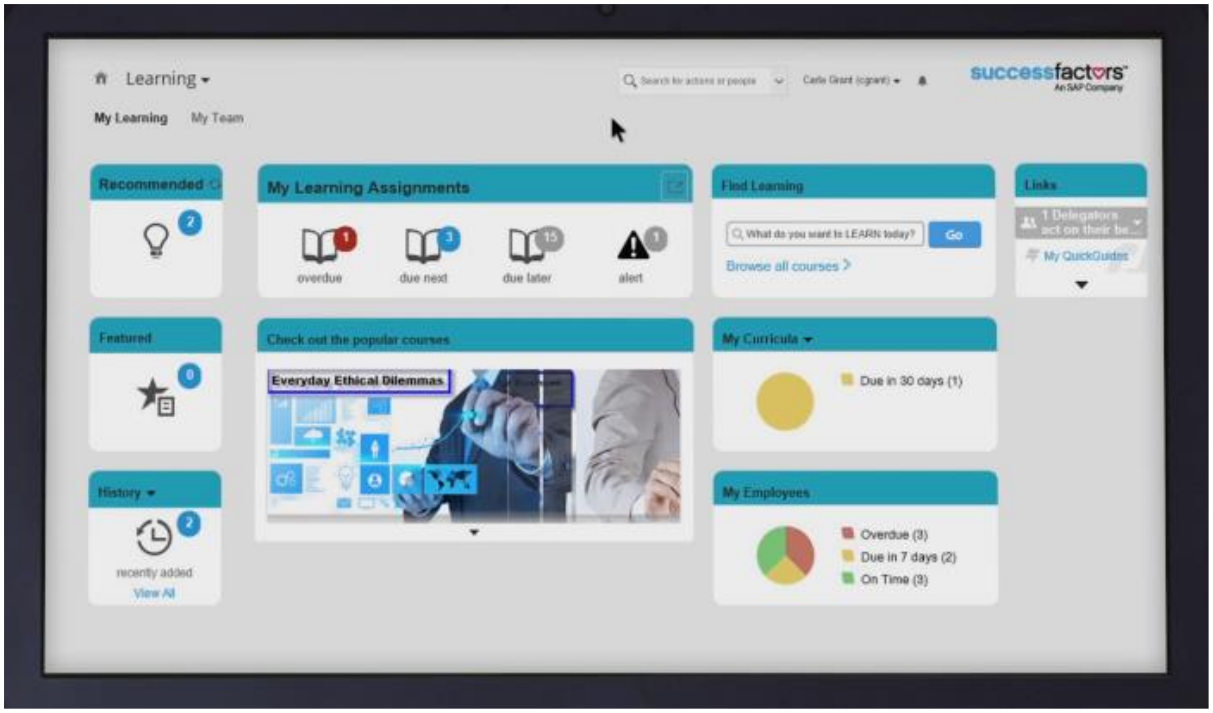

Figure 2.6: SuccessFactor site landing page (Kasim & Khalid, 2016)

2.7.6 SumTotal

SumTotal is another commercial platform. The function of this system is more towards the human resources field. There are four versions of SumTotal: SumTotal Learn, SumTotal Talent, SumTotal Work, and SumTotalelix HR.

SumTotal Learn is an LMS that provides personal and contextual learning to help employees work better (Kasim & Khalid, 2016). SumTotal Talent is able to identify hidden talents and abilities among consumers, and can also provide tools to help users become more productive (Kasim & Khalid, 2016). The role of SumTotal Work is to improve the efficiency and effectiveness of all aspects of workforce management, including salary and expense management. SumTotalelix HR gives an overall assessment of a company's human resources data. The function of SumTotalelix HR is to extend and connect information about HR processes, to integrate data, systems and processes from different HR and business applications to present a global view of the workforce (Kasim & Khalid, 2016). Figure 2.6 shows the landing page of the SumTotal platform.

Figure 2.7: SumTotal site landing page (Kasim & Khalid, 2016)

Table 2.3 provides a comparison of the six LMS platforms discussed.

Table *2.3*: Comparison of LMS platforms

Characteristics	LMS					
	Open Source			Commercial Source		
	Moodle	Sakai	A Tutor	Black board	Success Factor	SumTotal
Based on the cloud	X	X	✓	✓	✓	✓
Flexible	✓	✓	✓	✓	✓	✓
Easy to use	✓	✓	✓	X	✓	✓
Able to integrate with other systems	✓	✓	X	X	X	✓
Accessible	✓	✓	✓	✓	✓	✓
User-friendly	✓	✓	✓	✓	✓	✓
Synchronous and asynchronous interaction	✓	✓	X	✓	X	X
Able to see who is online	✓	✓	X	X	X	X
Personal space for draft writing and journals, as well as managing personal and private information	✓	✓	X	X	X	X
Able to send and receive personal messages with other users	✓	✓	✓	X	✓	X
Lecturers and students able to adapt and manage the courses in the software	X	X	✓	X	X	X
Each user has file storing utility and the storage can be shared with other users	X	X	✓	X	X	X
The entire content and course structure can be stored and backed up in the software	X	X	✓	X	X	X
Administrator can restrict user access or give multiple roles to multiple users	X	X	X	X	✓	X
Provides contextual learning, able to identify talent, improve the efficiency and effectiveness of workforce management	X	X	X	X	X	✓

Source: Kasim and Khalid (2016, p. 5)

2.8 The Learning Management System at UNIZULU

The antecedent sections have addressed learning management systems in general, giving an overview of how they are structured. The LMS of choice at UNIZULU is Moodle. Focus is hereby shifted to this LMS in terms of its uses, advantages and disadvantages, adoption and acceptance, as well as factors affecting its acceptance.

2.8.1 Use of Moodle

The advent of technology has affected various aspects of society in practically every sector: manufacturing industry, mining, agriculture, tourism, communications, transport, wholesale and retail trade, financial services, and the educational system. The advancement of technology has allowed for innovation in learning through many different platforms such as zoom, Microsoft Teams, ted4life and many others, including open learning source platforms, such as Moodle. The open source learning platforms, Moodle included, have revolutionised classrooms from synchronous to blended and online, which basically means learning with technology (Clare et al., 2019).

Moodle was developed as part of Martin Dougiamas' PhD education thesis (Conboy et al., 2009; Petter et al., 2008; Sikari & Harikrishnan, 2017; Urbina et al., 2019). Since its first development in 1999, Moodle has continued to evolve in terms of accessibility and flexibility because its features can easily be customised (Chewe & Chitumbo, 2012). Although initially designed for higher education environments (Dougiamas, 1998; Mealor, 2016), Moodle has quickly become used across a broad range of organisations worldwide to conduct courses fully online or support face-to-face teaching and learning. Its modularity, flexibility, security and free availability has attracted learning communities ranging from single primary school classrooms to large universities, businesses, government departments and other places where people learn (Chewe & Chitumbo, 2012).

Of the numerous open source platforms available globally, Moodle is the most popular LMS, utilised in approximately 230 countries, by approximately 156 million users, in 75 languages (Ahmad et al., 2012; Carrillo et al., 2018; Chewe & Chitumbo, 2012; Clare et al., 2019; Samos et al., 2019).

According to Momani (2010), Moodle features can be best understood from six classified main factors which are: a) Pedagogical factor, b) Learner environment, c)

Lecturer tools, d) Course and curriculum design, e) Administrator tools, and f) Technical specification. Hence, Moodle functionalities are divided into two groups, namely configured modules and external tools. The configured modules consist of assignments, workshops, quizzes, forums etc., and the external modules include blogs, questionnaires and wikis (Coates et al., 2005). (Costa et al., 2012) called these functionalities resources and modules.

Resources represent instructional materials that are usually created in digital formats and then uploaded to the platform. Web pages, PowerPoint files, Word documents, flash animations, video and audio files represent some examples of these resources. Modules are components created via Moodle in order to provide interaction among students and teachers towards manipulation and content transformation (Costa et al., 2012).

This LMS is conducive to learning because it is user friendly and incorporates online materials to enrich and enhance the learning process, as well as easy integration with other systems (Kasim & Khalid, 2016; Samos et al., 2019; Zakaria & Daud, 2013). Zakaria and Daud (2013) together with (Sánchez & Hueros, 2010) believed that this LMS increases universities' competitive advantage through increased efficiency of teaching. They also attested that Moodle enables greater accessibility of course content and materials. They concluded that virtual classrooms enable greater intake of students without expanding the physical boundaries of universities. The use of Moodle has been exponentially appreciated by higher education institutions (HEIs), over the years (Jebari et al., 2017).

2.8.2 Advantages and disadvantages of using Moodle

Many institutions worldwide choose Moodle as their LMS because of its rapidly growing presence, since it is open source. A global community of professionals and educators who are very passionate about promoting free software and improving the online learning experience support this LMS (Martinez & Jagannathan, 2008).

One advantage of using the Moodle LMS is that it is an open source software, thereby making it cheaper to access. Cost savings is not the key Moodle advantage though, but rather access to various innovative tools that interface with the Moodle platforms (Martinez & Jagannathan, 2008). Moodle provides adherence to open standards, and the promotion of interoperability, roles and user management, use of innovative plug-

ins, and the support from online communities of practice. It also has a large user community that fosters review, quality, reliability, accuracy, accountability, collaboration, and greater communication. Moodle users find that the breadth of talented people available across the globe is so great, that they can communicate with developers or download a patch at any time of day, anywhere in the world. Moodle greatly helps the education world set, follow, and maintain standards. Moodle developers lead the way in e-learning technology innovation because they can work as a community with common interests, and foster collaboration in the pursuit of knowledge sharing and rapid development. The other advantage of Moodle is that it is available in many languages, thereby greatly increasing the reach of the LMS to users everywhere (Kasim & Khalid, 2016; Martinez & Jagannathan, 2008).

In contrast, Moodle critics mention some issues with the platform. Some feel that Moodle is not quite “enterprise-ready”, nor able to support “mission critical” programmes (Martinez & Jagannathan, 2008). Others suggest that Moodle is not truly free, and is only as good as the expert support available. It was noted that problems may occur with too much customisation (Kasim & Khalid, 2016). Other common criticisms were that Moodle lacks the ability to integrate with human resource systems; the ability to integrate well between student administration systems and Moodle student information; the ability to support specific and complex business-process models; the ability to use a distributed administration model to support multiple “schools” and “departments”; the polished look of proprietary software, (it has a flat structure for organising and navigating learning materials); sophisticated assessment and grading capabilities; and efficient use of space, e.g., a fixed block at the top of the screen that wastes valuable screen “real estate” (Kasim & Khalid, 2016; Martinez & Jagannathan, 2008).

2.8.3 Moodle’s Enhancement of Teaching and Learning

Moodle’s learning innovations excite users. At its core, Moodle is an educational software grounded in a philosophy of collaborative learning, often referred to as social constructionist pedagogy. This approach views learning as a creative social process, as much as it is an individual one, where people learn together by investigating, analysing, collaborating, sharing, and reflecting, which is the main reason why it has

had such a rapid uptake among the educational community (Cole & Foster, 2007; Kasim & Khalid, 2016; Martinez & Jagannathan, 2008).

According to (Martinez & Jagannathan, 2008), Moodle was built with the elements and tools that embody pedagogical understanding, including the following concepts:

- Effective learning takes place when learners are actively engaged in constructing knowledge (i.e., creating or doing), rather than passively reading, memorizing, or viewing.
- An inquiry- and discovery-based approach is an effective way to learn.
- Students learn better with supplemental materials.
- Observing and interacting with peers and the community is also crucial for learning and retention.
- Collaborative environments encourage participants to be both teachers and learners at the same time.
- Learning environments need to be flexible, and adapt quickly to satisfy learner needs.
- Creativity and innovations are sparked (emotional appeal) when everyone has an opportunity to contribute, exercise their voice, and participate.

2.9 Moodle Adoption and Acceptance

Being an open source LMS, Moodle adoption and acceptance has been tried world over. Some institutions were successful but others failed owing to their different resource endowment. Institutions in rich countries seemed to be more successful in the adoption and acceptance of the LMS than their poorer counterparts in developing countries.

In this section, an analysis of success stories and failures from different countries is given. The analysis begins on a global scale, then moves to Africa, and finally focuses on South Africa.

2.9.1 Moodle Adoption and Acceptance Globally

As a learning management system, Moodle has been adopted by many countries globally. In trying to calculate the success of Moodle in Belize, Clare et al. (2019) designed a model that tracked the use of this LMS resource. They used the DeLone and McLean success model as their design. The model consists of seven dimensions, namely information quality, system quality, service quality, user satisfaction, use, perceived net benefits, and a complementary technology dimension. With a sample of 33 participants, they utilised both qualitative and quantitative methods. The research focused on students' perspective, since the student body was the primary end user of Moodle (Clare et al., 2019). Their findings indicated that the respondents believed Moodle's information quality, system quality, service quality, user satisfaction, use, perceived net benefits, and complementary technology were satisfactory.

In another attempt to measure the success of Moodle, Samos et al. (2019) used the DeLone and McLean information system success framework (Delone & McLean, 2003), with a sample of 120 participants. Their quantitative study had eight constructs: information quality, system quality, complimentary technology, self-efficacy measure, service quality, user satisfaction, use and perceived net benefits. Their results showed that all frequency distributions on the average response constructs were above neutral point, thereby concluding that the modular objective-oriented dynamic learning environment was fairly successful.

According to Samos et al. (2019), the most important construct to measure the success of Moodle was perceived net benefits. This construct provided a view of the level of satisfaction users have using the LMS. The results showed that the system was successful since participants were satisfied with the software. The satisfaction level means that participants found Moodle to be helpful and beneficial. System quality was rated highly. The majority of the participants concurred that the Moodle system was easy to use, very user-friendly and it provided access to high speed information. However, service quality was not profoundly rated, probably because the information technology technicians were not up to the standard required. The least varied constructs were complimentary technology and computer self-efficacy. This meant that participants were fairly satisfied with the level of technology at their disposal.

Measuring the success of Moodle is vital given the popularity of this LMS worldwide. In a paper entitled "*Moodle Management System's Success*" Williams et al. (2018) used all the six constructs of the Delone and McClean' information systems success model to estimate the success of Moodle (Delone & McLean, 2003), together with two complementary constracts. The eight constructs were: information quality, system quality, service quality, use, user satisfaction, and perceived net benefit plus complementary technology and self-efficacy as additions to their model (Williams et al., 2018). Using a sample of sixty participants, their results showed that their participants were generally not satisfied with the Moodle service. The majority of their participants agreed that service quality was Moodle's weakest characteristic, while the complementary technology of Moodle was its strongest aspect, although not by a significant margin (Williams et al., 2018).

In a quantitative study conducted in Malasia, Zakaria and Daud (2013) investigated post graduate students regarding the use of Moodle as a teaching and learning tool. With 21 participants, they focussed on the four variables of perceived usefulness, perceived ease of use, attitude, and computer self-efficacy. They used SPSS to estimate the use of Moodle by the students. Their results indicated that all the four constructs were in the affirmative, implying that participants had positive perceptions towards the use of Moodle in the classroom.

For the perceived usefulness component, they found out that Moodle made participants' learning more effective and efficient, thereby making their university life a lot easier, academically. For the computer self-efficacy component, participants indicated that they could access and navigate freely through the Moodle contents. For the perceived ease of use component, their participants indicated that Moodle was easy to use and to get study material. On attitude, participants indicated that using Moodle was a good idea and an attractive way to learn. They observed that, if Moodle is used appropriately and systematically, it can benefit students and lecturers accordingly. They therefore concluded that Moodle can safely be used as a tool for teaching and learning.

As learning management systems (LMS) become popular among academics around the world, as a tool for creating online dynamic websites for their students, Ahmad et al. (2012) investigated the use of Moodle at a university in Malasia, with the intention of its adoption in Nigerian universities, where an insignificant number of them were

fully employing this resource. They found that there was need and willingness to implement Moodle as an LMS. However, the acceptance and adoption this technology should be address properly through orientation to the general users of the new technology. Both human (experts, managers, and users) and material resources (computers, gadgets, hotspots, WIFI, café's mobiles etc.) need to be adequately in place for proper implementation of the LSM.

Using content analysis complemented with a non-structured interview applied to 278 participants and a questionnaire, Costa et al. (2012) analysed the functionalities and tools of the Moodle platform and their use by students, in a study carried out in Portugal. The study revealed that the most mentioned purposes of the use of Moodle were to 'download materials', 'news' and 'deliver assignments', and that the most used information materials were 'texts' and 'slides'. Additionally, more importance was given to 'news' and 'assignments'. These results were compatible with the hypothesis that Moodle was being used mainly as a repository of materials and information (Costa et al., 2012). They concluded that the successful use of the Moodle platform in the teaching and learning context critically depends on the teachers having knowledge about the tools, being aware of how they should be used, and being capable of organising all the communication process (Costa et al., 2012).

In trying to understand the motivational factors behind student satisfaction, or dissatisfaction, with Moodle, Sánchez and Hueros (2010) surveyed 226 students in a study that extended the technology acceptance model (TAM) to include technical support and perceived self-efficacy. They hoped that the extended constructs would help in understanding the factors that influence usage of Moodle by students. The following six variables were used in the study: technical support, perceived self-efficacy, perceived usefulness, perceived ease of use, attitude and system usage (Sánchez & Hueros, 2010). The sample of 226 students was split randomly into two subsamples: S1 contained 30% of the data, and S2 had 70%. The first exploratory analysis was carried out on sub-sample S1 (30%) using the SPSS program. Then Lisrel 8.80 and Amos 6 programs were used in the second confirmatory factorial analysis on sub-sample S2 (70%). The results of the empirical study were examined in three stages: (1) Exploratory analyses to examine the validity of the variables proposed and to contrast the initial reliability of the scales; (2) Confirmatory factorial analysis, to verify the dimensions obtained in the exploratory study and to allow set

scales to be purged, as well as to facilitate the checking of the psychometric properties of factors that form part of the model; and (3) Causal analysis that contrasts the proposed structural relationships.

Their results showed that technical support has a direct effect on perceived ease of use and perceived usefulness. Moodle usage was also directly influenced by perceived ease of use and attitude. The results also revealed the importance of perceived ease of use and perceived usefulness on attitude. They concluded that the success of the Moodle learning system depends largely on the acceptance and usage by the students themselves.

The purpose of another study across higher education institutions in Serbia, Lithuania and Bosnia and Herzegovina was to identify the factors affecting the effectiveness of Moodle from students' perspective. Damnjanovic et al. (2015) used the extended Seddon model with six elements, together with the TAM model. The six elements in their model were grouped into three, namely: information system quality (system quality, information quality); information system usage (perceived usefulness, satisfaction, performance outcome); and information system behaviour (behavioural intention to use the e-learning system in the future). Their findings offered an insight into those factors that are likely significant antecedents for planning and implementing a Moodle e-learning system to enhance student-learning effectiveness. System and information quality did not influence satisfaction, while satisfaction had a significant effect on behaviour intention, accounting for 68.4% of the variance.

2.9.2 Moodle Adoption and Acceptance in Africa

There has been a remarkable increase in the adoption and use of learning management systems (LMS) in sub-Saharan Africa, in a bid to improve the quality of on-campus delivery, as well as increasing access to education through blended and distance learning (Chitanana et al., 2008; Mtebe, 2015). Despite the increased adoption of LMSs in the region, their potential has not been fully exploited, as relatively few users tend to use them, thereby not justifying the high infrastructure investment costs (Bagarukayo & Kalema, 2015; Chitanana et al., 2008; Mtebe & Kondoro, 2016).

In a bid to increase access and usage of the Moodle system, Mtebe and Kondoro (2016) investigated the configuration and use of Mobile Moodle to enhance the Moodle LMS usage and accessibility via mobile phones at the University of Dar es Salaam in

Tanzania. Their study revealed that most students used Course View and User List features to read course notes and to check grades for their fellow students. Furthermore, students indicated that the Mobile Moodle was easy to use and enable them to accomplish learning activities more quickly. These results are evidence that some sub-Saharan Africa universities support the adoption and use of LMSs.

In Zambia, Chewe and Chitumbo (2012) set out to investigate factors that would impede the process of adopting Moodle and how they could be mitigated. They used a mixed methods approach with a sample of 80 participants for the quantitative survey and 3 interviewees for the qualitative part. The quantitative data were analysed using SPSS and the qualitative data were analysed by content analysis. The three standout variables that they investigated were Moodle awareness, Moodle use, and willingness to adopt Moodle. Their results revealed that participants were largely not aware of the existence of the software, and they therefore did not use it, but were willing to use it should it be made available.

Maphosa et al. (2020) investigated factors that influence the use of the Moodle LMS for the effective teaching and learning activities at a rural university in Zimbabwe using the technology acceptance model as a theoretical framework. They were more interested in students' perceptions and attitudes towards, perceived ease of use and perceived usefulness of Moodle. Their respondents felt that Moodle was easy to use and useful and had a positive attitude towards its usage. Their results revealed that the implementation of the Moodle LMS as a learning tool positively motivated the respondents. They, however, noted that the successful implementation of an LMS requires a robust network and continuous upgrade of the bandwidth as the majority of respondents felt that network failure negatively impacted on Moodle usage.

2.9.3 Moodle adoption and acceptance in South Africa

In a qualitative study that used the technological, pedagogical, and content knowledge (TPACK) theoretical framework in South Africa, Mpungose (2020b) proposed an alternative way of using WhatsApp to supplement Moodle. The objective of the study was to explore and understand first-year students' experiences of the use of Moodle and WhatsApp online platforms for learning physical science education modules. Mpungose (2020b) noted that students are compelled by South African universities to use the Moodle LMS which creates many challenges during the learning process,

since students struggle to use Moodle owing to their disadvantaged school background. This view points to the fact that South African universities have adopted the Moodle LMS but its full acceptance by students is still limited owing to challenges beyond their control. Mpungose's study revealed that students preferred to augment the university adopted Moodle LMS with WhatsApp, with which they were more familiar, though it was an informal e-learning platform.

According to Singh and Gokool (2018), Moodle is the official LMS at the University of KwaZulu-Natal in South Africa, such that all academics are mandated to integrate it into their respective disciplines for teaching and learning. This created a space for the researchers to experiment with the Moodle Quiz Tool as an alternate assessment method. Their study aimed to investigate students' perceptions and experiences on the integration and implementation of the Moodle Quiz Tool. Their results affirmed the numerous benefits of including the Moodle Quiz Tool as part of the assessment method, thereby confirming students' partial acceptance of using the Moodle LMS.

Maphalala and Mpofu (2018) explored the e-learning experiences of academic staff at a South African university after realising that there is a paucity of studies that seek to understand the South African experience of e-learning acceptance and usage in its universities. Using the activity theory, their qualitative study unearthed the following themes: there were challenges with technology infrastructure and internet accessibility on campus; technical support for students and staff; staff development and training; difficulty in creating e-learning content; and challenges with non-resident students. These challenges show that although the study was on staff members, the acceptance of e-learning in some South African universities is still far from satisfactory.

Using Mezirow's 1991 transformative learning theory, Mahabeer and Pirtheepal (2019) explored lecturers' experiences in using Moodle as a formative assessment tool in the context of university education. The qualitative study was carried out at the University of KwaZulu-Natal in South Africa. The results revealed that some lecturers acknowledged complexities associated with using Moodle, while the majority found Moodle (as an online assessment tool) rewarding and flexible in providing quick constructive and operational feedback to students. Although this study focused on lecturers using Moodle as an assessment tool, it also revealed that the LMS was being partially used at this South African university (as an assessment tool only).

Another study by Paideya (2019) investigated the effect of the Moodle LMS to support and supplement many courses at the University of KwaZulu-Natal. This mixed methods study revealed that students' successful engagement with the Moodle LMS depends on the structure and form of the support offerings. The results showed that students commented positively on their satisfaction with the online programme, but expressed dissatisfaction with limitations of the Moodle design and usage and how feedback was provided. This means that the students in this research were partially accepting the Moodle LMS.

At Stellenbosch University, Ndlovu and Mostert (2018), carried out a study to analyse the effect of using the Moodle platform as a learning management system to support a blended learning in-service course for secondary school mathematics teachers in South Africa. Using the 3-C (content, communication, and construction) and the instructional design models, their survey results revealed that although the Moodle platform had some limitations, it facilitated synchronous and asynchronous discussions between students and lecturers. Both the student-to-student and the lecturer-student interactions were of academic value and helped to reduce the barriers of physical and temporal separations. A major limitation in the integration of Moodle was the limited accessibility of the internet to some of the students.

A survey of the available literature shows that South African universities have embraced the adoption of the Moodle LMS but its acceptance by students is limited. Underlying challenges, such as lack of internet access, shortage of resources and general lack of training in using the resource, are contributory factors (Maphalala & Mpofu, 2018; Ndlovu & Mostert, 2018; Paideya, 2019; Singh & Gokool, 2018).

Available literature on the use of the Moodle LMS in South Africa also revealed that none of them has recommended a model of acceptance of the LMS by students. Most of them concern the use of Moodle by lecturers to assist students. All these gaps have prompted this research to investigate the factors affecting pre-service teachers' acceptance of the Moodle learning management system at a rural university in South Africa, as well as pre-service teachers' confidence and their preparedness to use the same.

2.10 Barriers to Moodle Implementation in Rural South African Universities

The successful implementation of the Moodle system in any institution hinges around an availability of resources and human expertise, of which many rural based universities in South Africa do not have (Mallinson & Krull, 2013).

The level of e-learning usage and adoption varies in different universities due to several challenges, such as those of technology and institutional differences (Bagarukayo & Kalema, 2015). Hence, university managements' involvement in policy decisions and investment in technological innovations to address these challenges is crucial.

2.10.1 Lack of Institutional Policies

Mallinson and Krull (2013) indicated that lack of institutional policies is one of the barriers to successful implementation of the Moodle system in institutions. Another barrier is the failure to take a systemic approach to information and communication technology implementation as a major challenge to successful implementation, and to advocate an institutional ICT policy and an institutional strategic plan for ICT project implementation (Sife et al., 2007). Unwin et al. (2010) also found that the absence of an e-learning policy in institutions can be a major factor limiting the use of the virtual learning environment. This is especially true for UNIZULU (Evans, 2013; University of Zululand, 2018), which started implementing the Moodle system as early as 2000, but did not have an approved e-learning policy and strategic plan until 2019 (University of Zululand, 2019).

2.10.2 Limited Technological Infrastructure

Limited technological infrastructure is yet another big challenge, as explained by Mallinson and Krull (2013), as a serious barrier to successful implementation of the Moodle system. Technical and infrastructural aspects are the main factors preventing wider roll out of the Moodle system (Isabirye & Dlodlo, 2014; Unwin et al., 2010). Poor internet access was acknowledged as a major limiting factor in the implementation of the Moodle virtual learning environment in African universities (Ssekakubo et al., 2011). Furthermore, limited bandwidth and the very high costs of internet access continue to inhibit the effective use of e-learning across African universities, although the use of the more stable local intranet has assisted a great deal in alleviating this

challenge (Unwin et al., 2010). Hence, most institutions host their own Moodle platforms on campus.

Another major factor limiting the use of the Moodle virtual learning environment in African universities is the unreliable supply of electricity, with institutions facing intermittent power cuts from very limited national electricity grids (Mtebe et al., 2011; Unwin et al., 2010). This is a serious problem in South Africa where the country sometimes faces country-wide electricity outages (called 'load shedding'), which may amount to periods stretching to four hours without electricity (Gehringer et al., 2018; Goldberg, 2016).

There are significant computer technology infrastructure gaps at UNIZULU, particularly because it is a rural university with a remote location from urban centres. (Bayaga et al., 2021; Evans, 2013).

2.10.3 Ineffective Maintenance

The configuration of hardware and software, as well as the ineffective maintenance of servers, are major barriers to the e-learning uptake in African universities (Mtebe et al., 2011; Ssekakubo et al., 2011). Appropriate server configuration is critical to maximise the affordance of the chosen hardware and software. For Moodle virtual learning environments implementations to be successful, maintenance and user support are crucial, especially given that they are the mechanisms through which inefficiencies and other usability problems can be identified and addressed (Brown et al., 2008; Ssekakubo et al., 2011). Many rural universities in South Africa lack maintenance strategies (Brown et al., 2008).

2.10.4 Lack of Technical Support

A lack of technical support is another serious problem facing universities in developing countries, South Africa included. The Moodle system thrives if the university has an ICT technical unit that offers support to users (Mlitwa & Van Belle, 2011), which unfortunately is not the case in many third world universities. In many cases, these units are understaffed or the staff are insufficiently trained to be able to deal with support at the required level (Sife et al., 2007; Ssekakubo et al., 2011). Unwin et al. (2010) reported that levels of training in the use of Moodle virtual learning environments are generally very low at African universities.

2.10.5 Large Classes

The growth of mass higher education has made large classes an endemic feature of several courses at higher education institutions (Jaffer et al., 2007). Empirical studies (Hornsby et al., 2013; Jaffer et al., 2007; Maringe & Sing, 2014) tend to point to classes of more than 100 students as large classes and these are common in undergraduate courses in programmes aimed at providing foundation level studies to students in their first year phases of learning at universities. Large class sizes make it difficult for teachers to employ interactive teaching strategies (Nicol & Boyle, 2003) or to gain insight into the difficulties experienced by students and the students themselves get frustrated if they cannot get attention. In large classes, the chances that many students can complete a whole semester of study without experiencing a single episode of interaction with the lecturer is very high (Maringe & Sing, 2014; Venter et al., 2012). Large classes pose problems for all students but students who are under-prepared are particularly affected. It is these contexts that provide useful opportunities for educational technologies. The problem of large classes is exacerbated in rural universities by the limited availability of technological resources that could be used to access all students easily. The use of LMSs can be a solution to this problem.

2.11 Factors That Affect the Acceptance of the Moodle LMS

Many studies were conducted to determine the factors that affect the acceptance of technology, although none specifically targeted pre-service teachers at rural universities (Binyamin et al., 2019; Dougiamas & Taylor, 2003; Joo Young Ju et al., 2018; Mohammadi & Mahmoodi, 2019; Shittu et al., 2015). Some of the factors identified include motivation, attitudes, beliefs, leadership, and performance. Factors that affect the acceptance of technology have their roots in the technology acceptance model (TAM). The TAM has received theoretical and empirical support as a model that measures the acceptance of technology (Padilla-Meléndez et al., 2012). The TAM was developed by Davis (1989), based on the theoretical underpinnings of the theory of reasoned action (Fishbein & Ajzen, 1975), in order to predict users' acceptance of a given technology.

The TAM assumes that behavioural intention to use the system predicts the system's acceptance and use. Davis (1989) identified three factors that determine the

behavioural intention to use an information system: users' attitudes (ATT), perceived ease of use (PEOU), and perceived usefulness (PU). Perceived ease of use and perceived usefulness are the primary predictors of acceptance of the information system and they are called extrinsic motivators (Padilla-Meléndez et al., 2012), because they result in the user performing an activity to attain valued outcomes, which are different from the activity itself. For instance, students will use the Moodle LMS not because they enjoy using it, but because they want to meet their academic goals (Saleem et al., 2016). With time, other factors were added to the TAM as intrinsic motivators (Binyamin et al., 2019; Mohammadi & Mahmoodi, 2019) because they enabled users to perform certain activities for no other reason other than just enjoying to perform it. This is what Venkatesh (2000) called perceived enjoyment (PE). Tan et al. (2012) referred to other significant factors, including satisfaction, usefulness, attitude, motivation and fun, which were part of various other models after the TAM. In this study, the extended TAM is going to be used to analyse the factors that affect pre-service teachers' acceptance, confidence, and preparedness to use the Moodle LMS.

In a systematic review of mobile learning adoption, Kumar and Chand (2019) stated that there are 63 factors that influence the adoption and eventual acceptance of an information system. Due to the similarities in these 63 factors, researchers categorised them into 15 major factors (Kumar & Chand, 2019; Liu et al., 2018; Nikou & Economides, 2016) which are: perceived attitude, anxiety, behavioural intention, perceived ease of use, perceived enjoyment, learner interest, prior experience, usefulness, learnability, personal, technological, social influence, financial, pedagogical, and readiness.

According to Kumar and Chand (2019), the key factors are: perceived attitudes; behavioural intention; enjoyment; perceived ease of use; experience; perceived usefulness; learnability; and personal and social influence. Kumar and Chand (2019) also noted that the factors of interest, anxiety, technological, financial and pedagogical have minimal impact on the acceptance of the information system. Although the study by Kumar and Chand (2019) was centred on the acceptance of mobile learning, it should be noted that the very same factors that affect the acceptance of mobile learning do also affect the acceptance of LMSs in general, and Moodle is no exception.

In an empirical study based on TAM, Essel and Wilson (2017) investigated factors that affect university students' use of Moodle at the University of Education, Winneba, in

Ghana. They noted that students' and lecturers' 'buy in' was crucial for a successful implementation of the Moodle LMS. In support, Hall and Yeats (2006) also noted that successful implementation of the Moodle LMS depends not only on providing training and support to users, but also that attention must be given to the level of students' active engagement, satisfaction and use of the LMS. The two key factors identified by Essel and Wilson (2017) were: perceived usefulness (PU), being the degree to which the students believe that using Moodle would enhance their performance and perceived ease of use (PEOU), being the degree to which the students believe that using Moodle is free of effort. Their results showed that the mean score on their indicator items ranged from 2.56 to 3.55, which were all greater than the midpoint of 2.5. This means that the students agreed that Moodle helps them to find information they need on a course (M=3.25, SD=0.703); has positive impact on their learning (M=3.23, SD=0.682); and helps them keep up with their course work (M=3.19, SD=0.659). However, the factor of perceived ease of use of Moodle recorded a low acceptance (M=1.904, SD=0.506), an indication that students faced some challenges with using Moodle. It was, therefore, concluded that the factors perceived usefulness (PU) and perceived ease of use (PEOU) were critical to the students' acceptance or non-acceptance of the Moodle LMS at the University of Education, Winneba, in Ghana.

At the Federal University of Technology, Minna, in Nigeria, (Shittu et al., 2015) enquired into the determinants of factors influencing the use of Moodle online resources for learning among student-teachers. Using a sample of 200 student teachers, they identified three key factors that determine student teachers' behavioural intention (BI) to use the Moodle LMS. The three factors were school environment (SCHENV), computer self-efficacy (CSE) and students attitude (ATT) (Shittu et al., 2015). Their results showed that CSE positively influenced students' behavioural intention towards the uptake of Moodle for learning. CSE explained 47% of the variance in acceptance of Moodle by the student teachers, a finding which was in agreement with that reported by Wong et al. (2014), that CSE has a big statistical influence on behavioural intention. Hence, it is an important factor for the use of Moodle among Malaysian teachers. The students' attitude towards the use of Moodle was statistically significant, accounting for 25% of the explained variance in the model, thereby concluding that student teachers' attitude positively influenced their

behavioural intention towards the use of Moodle. Lastly, school environment explained 14% of the variance on the use of Moodle, meaning that the school environment positively influenced CSE and student teachers' attitude towards behavioural intention to use Moodle.

In an attempt to understand teachers' acceptance of blended e-learning in teaching and learning, Wong et al. (2014) carried out an empirical study on Malaysian practising teachers' perspectives on factors that drive the use of Moodle at Sutlan Idris Education University, Malaysia. Using a sample of 98 teachers, they examined the effects of endogenous variables (factors) towards blended e-learning acceptance. Using structural equation modelling (SEM), they analysed computer attitudes (CA), computer teaching efficacy (CTE), and school environment (SE) to understand these factors' influence on Moodle use (MU). Their results showed that Moodle use was significantly determined by the three factors: computer attitudes (explaining 11% of the variance in Moodle use); computer teaching efficacy (explaining 18% of the variance in Moodle use); and school environment (explaining 60% of the variance in Moodle use). Together, the three variables explained 55.9% of the variance in Moodle use among teachers. These three factors had direct effects towards the levels of integration of Moodle use in teaching and learning at Sutlan Idris Education University, Malaysia (Wong et al., 2014).

Šumak et al. (2011) examined the factors that have an impact on students' perceptions about the use and acceptance of Moodle in Slovenia. They used TAM as the underlying theory and the structural equations modelling as their preferred data analysis tool, using the Amos 17.0 software, together with SPSS. They used five factors: perceived usefulness (PU), perceived ease of use (PEOU), attitude toward using technology (ATU), behavioural intention (BI), and actual use (AU). The results of the analysis revealed that the actual use of Moodle depends on two main factors: behavioural intentions and attitudes toward using Moodle. Perceived usefulness was found as the strongest and the most important predictor of attitudes toward using Moodle.

At King Abdulaziz University in Saudi Arabia, (Binyamin et al., 2018) developed a model to predict the factors that influence the use of learning management systems (LMS) among higher educational students by applying the extended TAM model. The five factors they used were perceived usefulness (PU), perceived ease of use (PEOU),

behavioural intention to use (BIU), computer self-efficacy (CSE) and subjective norms (SN). The first three factors are TAM constructs, while the last two were their extensions. Subjective norms and social influence can be used interchangeably (Tarhini et al., 2014). This shows the degree to which people feel that others influence whether they should or should not complete a particular behaviour (Rabaa'i, 2016; Tarhini et al., 2014). The results of this study revealed that perceived ease of use had a positive influence on perceived usefulness ($\beta = 0.417$, $p < 0.001$); perceived usefulness had a positive effect on behavioural intention ($\beta = 0.689$, $p < 0.001$); behavioural intention strongly influenced actual use ($\beta = 0.600$, $p < 0.001$); perceived ease of use was directly affected by computer self-efficacy ($\beta = 0.558$, $p < 0.001$); computer self-efficacy was the most robust predictor of perceived ease of use ($\beta = 0.572$, $p < 0.001$); subjective norm positively influenced perceived usefulness ($\beta = 0.312$, $p < 0.001$) but not perceived ease of use. From these results, Binyamin et al. (2018) concluded that computer self-efficacy and subjective norm are the two required factors that influence students' use of the LMS at King Abdulaziz University, in Saudi Arabia.

Using the extended TAM, Rabaa'i (2016) assessed the factors that influence university students' intention to use the Moodle e-learning system at the American University of Kuwait, in Kuwait. With a sample of 515 students, Rabaa'i (2016) employed the structural equation modelling - partial least squares (SEM-PLS) technique to analyse data on the seven factors that were assumed to be affecting acceptance of Moodle at the university. The factors were perceived credibility (PC), satisfaction (S), subjective norm (SN), self-efficacy (SE), perceived ease of use (PEOU), perceived usefulness (PU) and attitude (ATT). The last three factors are the TAM variables, while the first five were the factors used to extend the TAM in this study. Perceived credibility designates the perception of protection of students' transaction details and personal data against illegal entrance, which outlines two important dimensions of security and privacy (Hoffman et al., 1999; Oni & Ayo, 2010; Rabaa'i, 2016). The results of the study showed that perceived credibility had a positive association with perceived ease of use (Beta = 0.133, p-value = 0.018); perceived credibility had a positive association with perceived usefulness (Beta=0.323, p-value = 0.000); self-efficacy had a positive influence on perceived ease of use (Beta = 0.394, p-value = 0.000); self-efficacy had a positive influence on perceived usefulness (Beta = 0.135, p-value = 0.006);

subjective norm had a positive influence on with perceived ease of use (Beta = 0.262, p-value = 0.000); subjective norm had a positive association with perceived usefulness (Beta = 0.117, p-value = 0.015); satisfaction had a positive association with both perceived ease of use and perceived usefulness (Beta = 0.165, p-value = 0.002) and (Beta = 0.400, p-value = 0.000) respectively. Perceived usefulness had a positive influence on attitude (Beta = 0.698, p-value = 0.000); perceived ease of use had a positive association with attitude (Beta = 0.240, p-value = 0.000); and finally that there was a strong association between attitude and intention to use (Beta = 0.810, p-value = 0.000). The research concluded that the exogenous variables perceived credibility, satisfaction, subjective norm, self-efficacy, perceived ease of use, perceived usefulness and attitude positively affected the endogenous variable intention to use Moodle (Rabaa'i, 2016).

In a conceptual paper, Al Amoush and Sandhu (2018) explored the main factors influencing the acceptance of using LMSs in Jordanian universities. They added two external factors to the modified TAM: Firstly, IT infrastructure, being the availability of technology such as internet connections, computers and LMS tools (Al Amoush & Sandhu, 2018; AlQudah, 2014; Baker et al., 2007); and secondly, culture, being the unique culture in Jordan which influences the use of LMSs in different ways (Al Amoush & Sandhu, 2018; Cho & Berge, 2002). Hence, their model (Figure 2.7), with modified TAM variables, had five factors.

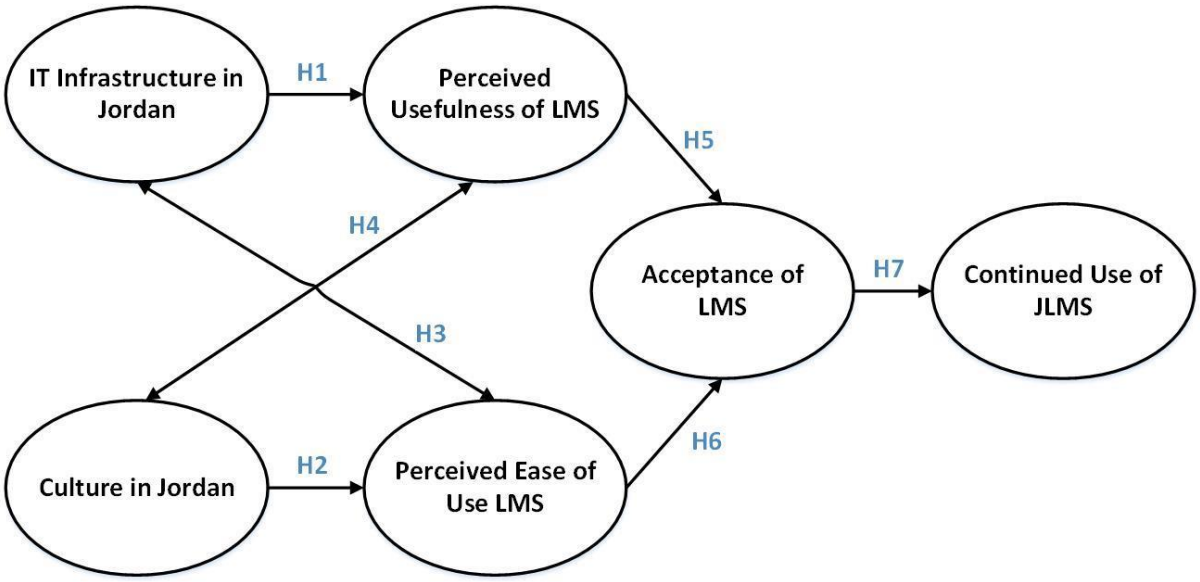

Figure 2.7: Jordanian learning management system model (Al Amoush & Sandhu, 2018)

The three modified factors were perceived usefulness of LMS (being the degree to which the user believes that using the LMS would improve their learning performance); perceived ease of use of LMS (being the degree to which the user believes that using the LMS will be free of effort); and acceptance of LMS (being the explained construct in the study). All three were proxies for the TAM constructs (Venkatesh & Davis, 2000) of perceived usefulness (PU), perceived ease of use (PEOU), and behavioural intention (BI) respectively. The factors in the model (Figure 2.7) were used to explain the acceptance of the LMS regarding the continued use of the LMS in Jordanian universities, although there was no empirical evidence to support the conceptual viewpoint. In this study the researcher hopes to provide the empirical axis of the continued use construct.

A plethora of studies have identified numerous factors or variables known to affect the acceptance of the Moodle LMS in institutions of higher learning (Al Amoush & Sandhu, 2018; Binyamin et al., 2018; Essel & Wilson, 2017; Rabaa'i, 2016; Shittu et al., 2015; Šumak et al., 2011; Venkatesh & Davis, 2000; Wong et al., 2014). Such factors have been captured in various models that include the TAM, the extended TAM, UTAUT and many more. However, the identified factors affect users differently depending on conditions in different countries and on different LMSs (Al-hawari & Mouakket, 2010). Unfortunately, there is no known study that was carried out in South Africa that developed a model of such factors. It is for this reason that this study is being carried out, specifically to identify factors that predict pre-service teachers' acceptance of the Moodle LMS at a rural based university in South Africa and recommend a suitable model to that effect.

2.12 Factors That Affect Continued Use of the Moodle LMS

In section 2.10, the factors that affect the acceptance of information communication technologies were explained. The majority of the factors cited in many studies (Abdullah & Ward, 2016; Amin et al., 2016; Igbaria & Iivari, 1995; Mathieson et al., 2001; Mutambara & Bayaga, 2020b; Sánchez & Hueros, 2010; Venkatesh & Davis, 2000) utilise the TAM. While the TAM (with its minor inconsistences) was a very good model for predicting the adoption and acceptance of information communication technologies, it does not show much beyond acceptance. Inasmuch as the TAM can

be extended to develop a fully-fledged model that can explain and predict acceptance of technology in different contexts, Lim (2018) observed that the theory was developed when digital technologies were still emerging, and as such it now needs to be expanded in order to capture topical issues existing now. Mazaheri et al. (2020) concurred by calling for its reinvestigation in contemporary settings.

Based on this notion, this study was designed to also capture the next step after the acceptance of the underlying technology (Moodle LMS). This was done by adding the continued use construct, which in turn is explained by two other constructs, confidence in using and preparedness to use the Moodle LMS.

2.12.1 Continued Use of the Moodle LMS

The continued use construct was coined specifically for this study in order to explain pre-service teachers' continued use of the MLMS after its acceptance. In researching about pre-service teachers' acceptance, confidence, and preparedness to use the Moodle LMS, it is envisaged that pre-service teachers are not going to accept the technology just for its own sake but because there is need for it, and hence the inclusion of the construct. However, there is not much empirical literature available for this relatively new construct, in line with the MLMS. The conceptual paper by Al Amoush and Sandhu (2018) gave continued use after the focal construct of acceptance of the LMS.

2.12.2 Confidence in Using the Moodle LMS

Just as explained in sections 2.11 and 2.11.1, the "confidence in using" construct was specifically coined for this study to ascertain whether pre-service teachers are confident in using the Moodle LMS as they continue to use it in their studies. The construct is envisaged to feed off the "continued use" construct. In the body of knowledge "confidence in using" is hardly mentioned as a construct, except instances where researchers mentioned, in passing, that users where confident in using the Moodle LMS or not.

In a study on explaining how digital competences of pre-service teachers can be developed, Reisoğlu and Çebi (2020) reported that pre-service teachers' self-confidence in the use of technology increased with the assistance of applications in the training. While exploring pre-service teachers' beliefs about using Web 2.0

technologies, Sadaf et al. (2012) found the pre-service teachers reported moderate confidence for using Web 2.0 technologies. List (2019) reported that students express a great deal of confidence in their own digital literacy. In a study carried out at Ahlia University in the Kingdom of Bahrain concerning interest in how the use of Moodle would sustain, improve and develop student's learning in higher institutions, Hajjar (2015) reported that 100% of the faculty members expressed self-confidence in their skill to use Moodle, and that the majority of the students (75%) had shown significant confidence in their capability to use Moodle.

The confidence to use technologies in education is not all encouraging though. In an investigation of the opportunities and challenges of using e-learning in Zimbabwe, Chitanana et al. (2008) stated that a substantial number of users lacked confidence in the use of e-learning platforms. The preceding facts about user confidence in ICTs provide hope for developing this construct, which this study is attempting to measure in terms of confidence in using the Moodle LMS.

2.12.3 Preparedness to Use the Moodle LMS

Preparedness is the state or condition of being ready, and it emphasises the attitudinal aspect of being ready to do something (Gill & Dalgarno, 2008). In this study, it was predicted that pre-service teachers should be ready or prepared to continue using the Moodle LMS their acceptance of the resource. The preparedness to use construct is also designed to depend on continued use.

In an endeavour to understand influences on pre-service teachers' preparedness to use ICTs in the classroom, Gill and Dalgarno (2008) reported a high level of preparedness to use ICTs in the classroom. There was evidence supporting the relationship between the perceived usefulness of ICTs, the perceived ease of use of ICTs, attitudes towards using ICTs, and that these constructs relate to expressed preparedness to use ICTs for learning and teaching (Gill & Dalgarno, 2008).

In a separate study to determine the influence of preparedness on online students' feelings of anxiety, Abdous (2019) reported that students expressed a high level of preparedness to take online courses. In a study by Chitanana et al. (2008), 47% of the users expressed some doubt on their level of preparedness to use e-learning platforms available at their universities.

2.13 Effects of Demographic Factors on the Acceptance of the Moodle LMS

Demographics refer to the collection and analysis of broad characteristics about groups of people and populations. Demographic data are information about groups of people according to attributes such as age, gender, place of residence, as well as socio-economic factors, such as occupation, family status, or income (Cruz-Cárdenas et al., 2019; Kupangwa & Dubihlela, 2016). Demographic factors play an important role in the acceptance of technology by users.

This study focused on the three demographic factors: gender, age, and degree level. Due to the unique characteristics of participants from rural universities, this was necessary. Most participants in this study come from very poor rural communities, with little or no access to computing resources. The home background is always a factor in these communities. Sometimes a child can pass and qualify for entrance into university but may not enrol due to a lack of money for fees and other resources like electronic devices and textbooks. The child may finally go to university after a couple of years when monies become available.

In these rural communities, there are also strong stereotypical behaviours regarding things that can be accomplished by different gender groups. For example, in some rural communities, complex ICT jobs are a prerogative of men, while women are relegated to informal jobs such as subsistence agriculture (Shava, 2021). In this study, the researcher intended to find out if the stated demographic variables had an effect on the relationships between PSTs' actual use of the MLMS and their continued use of the resource. In other words, the researcher intended to find the moderating effects of demographic variables on the explained variables of the model.

2.13.1 Gender

In a study to investigate the relationship between selected employee demographic variables and the perceived factors that influence the adoption and use of e-business technologies, Kupangwa and Dubihlela (2016) found that 58.3% of their respondents were male and 41.7% were female, an indication that technology use is dominated by males in South Africa. This notion was shared by Kotze et al. (2016) who found that there are gender differences in the adoption of high technology products between male and female individuals. Venkatesh and Davis (2000) also suggested that males and females behave differently when it comes to technology adoption and use. These

results were not consistent with those of Whitley Jr (1997), whose research on gender differences in computer-related attitudes and behaviour using USA and Canadian participants, found that gender differences in computer-related behaviours were small and did not differ as a function of study population.

In studying perceived playfulness, gender differences and the technology acceptance model in a blended learning scenario, Padilla-MeléNdez et al. (2013) found that there was no significant differences found between gender and perceived usefulness, and between gender and ease of use.

Alternatively, the results from older studies seem to contradict this notion. For example, Thompson and Lim (1996) examined gender differences in the factors related to computer usage and found that females tend to view computers as being less easy to use compared to males. Schumacher and Morahan-Martin (2001) analysed changes in computer experiences among incoming college students and observed that males were more experienced than females with computer programming and games. It was concluded that this greater experience may enhance the technical sophistication of males with computers and account for the greater degree of competency and comfort with both the internet and computers found among male students compared with female students.

However, in a study to analyse the effects of gender and age on new technology implementation in a developing country, Baker et al. (2007) found a non-significant association between gender as a moderating variable on behavioural intention.

2.13.2 Age

At the institution where this study was conducted, age is a factor in the selection of first-time pre-service teachers. There is a quota system that allows for the selection of different age groups of first-time faculty of education scholars. A requirement in the selection process is that 70% have to come from current matriculants (high school finalists), 25% from the previous year and beyond, and the remaining 5% from older applicants recommended by the responsible higher education authority (University of Zululand, 2013). This creates a notable age gap among participants. In this regard, this study seeks to determine if the age variable could be a moderator in the relationships that exist within the model.

The effect of the age characteristic on the acceptance and use of technology is critical because, generally, older people find it difficult to catch up easily with new technologies, while the younger generations are seemingly much more comfortable. Older people are referred to as generation X or digital immigrants, while younger people are called generation Z or digital natives (Kirschner & De Bruyckere, 2017). A digital native is a person born or brought up during the age of digital technology and is familiar with computers and the internet from an early age (Thomas, 2011). The term was coined by Mark Prensky in 2001 and was used to describe the generation of people who grew up in the era of ubiquitous technology, including computers and the internet (Prensky, 2001).

The opposite of digital natives are digital immigrants which refer to people who were born before technology and had to adapt to the new language of technology (Sorrentino, 2018). The salient feature about the age characteristic is that young people who grew up in the technological era typically find it easier to accept and adopt technology than older generations.

In a study to analyse the effects of gender and age on new technology implementation, Baker et al. (2007) established that age and gender were non-significant moderators of attitude, subjective norm, and perceived behavioural control as they affect behavioural intention to use technology. Cruz-Cárdenas et al. (2019) analysed the role of demographic factors and attitudes towards technology and they established that demographic variables, particularly age, educational level, and income, were central in explaining the variance in the use of technologies in developing and emerging countries.

Morris & Venkatesh, (2000) established that there were differences in respect to age in the adoption and use of e-business technology within firms. They argued that younger employees' attitudes toward using a new technology were more salient than older workers. Other studies found that age is a significant predictor of behavioural intention to adopt the tablet technology (Aliyu et al., 2019; Magsamen-Conrad et al., 2015). In a research on student acceptance of learning management systems, Claar et al. (2014) focussed on participants' demographics and one of their findings was that the higher a person's age, the more likely they are to perceive a new LMS negatively. This means that older users are less keen to accept new technologies and that they

would rather continue using the technologies with which they are most familiar and comfortable.

2.13.3 Level of Study

A level of study in this research refers to the participants' year of study: whether the participant is a first year, second year, third year, fourth year, or a postgraduate student. In other studies, this characteristic is referred to as education level or experience(Aliyu et al., 2019; Claar et al., 2014). This variable is considered very important at the institution where this research is taking place. When pre-service teachers arrive for their level 1 studies at the University of Zululand, the majority of them have very limited experience navigating the world of computers, which is experientially foundational of university communication. This is because the majority of them come from completely rural areas where access to computing resources is almost non-existent. Many will be seeing and using computers for the first time in their lives. Their level of computer self-efficacy is typically considered very low, to the extent that the university registers them into a compulsory computer literacy module that is offered in the first semester of level 1. As they graduate into levels 2, 3, and 4, their competence in use of computers increases and positively affects their use of the MLMS. This research therefore seeks to find out whether PSTs' level of study moderates their continued use of the MLMS.

In their study on student acceptance of learning management systems, Claar et al. (2014) hypothesised that education level will have significant influence on perceived usefulness and perceived ease of use respectively. In their results, both hypotheses were supported and they concluded that education level showed significant impact on students' acceptance of LMS. Aliyu et al. (2019) established that experience of business students moderates their intention and use behaviour.

2.14 State of the Moodle LMS at UNIZULU

UNIZULU is a comprehensive rural based university in the KwaZulu-Natal province of South Africa. It has two campuses: one at Ongoye (also known as KwaDlangezwa) and the other in Richards Bay (University of Zululand, 2019). The university is a traditional contact institution offering certificate, diploma, and degree programmes. UNIZULU has four faculties, namely the Faculty of Arts; Faculty of Education; Faculty

of Administration, Commerce and Law; and Faculty of Science and Agriculture. All four faculties share common ICT resources which are centrally managed by the ICT department (University of Zululand, 2018, 2019).

The ICT resources include computer laboratories that are equipped with computers and full internet access, although the bandwidth is usually insufficient, especially if many people connect at the same time (Evans, 2013). The largest computer lab at the institution has a capacity of 164 workstations. There are a few other ones with capacities of 100 workstations, 50 workstations, and 25 workstations, over and above the many small departmental computer labs. For students who have their own laptops or smartphones, the university provides wireless connectivity in designated areas (University of Zululand, 2019). Each of the faculties has its own instance of the Moodle LMS.

2.15 Faculty of Education Moodle LMS Instance

The Faculty of Education Moodle LMS instance was designed to service all its pre-service teachers (being all undergraduate students from levels 1 to 4), its postgraduate students, as well as its staff members. It is managed by two Moodle managers (lecturers in the faculty) who report to ICT through the ICT committee (University of Zululand, 2019). The two managers can access courses and modify them on behalf of the over 80 lecturers and nearly 5 000 students in the faculty, who are distributed in seven departments.

Using the Moodle LMS was not compulsory in the faculty, until the publication of the e-learning policy in 2019 (University of Zululand, 2019) and at least prior to the Covid-19 pandemic. The pandemic has now forced everyone to make use of the Moodle LMS, although not all students had access to it due to the university shutdown caused by Covid-19 lockdown restrictions.

Antecedent to the state of the Moodle LMS at UNIZULU, the institution has adopted the LMS, the infrastructure exists and there is the support from administrators, evidenced by the institutional e-learning policy and the e-learning strategy documents (University of Zululand, 2018, 2019). However, the uptake is not fully fledged. The question is what reasons are there for why staff and students are not fully participating in using this resource.

The literature discussed has tried to give possible factors that affect the acceptance of LMSs by higher education institutions worldwide but there does not seem to be much research available on the factors affecting pre-service teachers' acceptance of the Moodle LMS, vis-à-vis the confidence and preparedness to use the resource in rural universities. It is anticipated that this research study will help to fill this gap and provide insight into the full utilisation of LMSs in rural universities.

2.16 Summary of Gaps in the Body of Knowledge

In investigating pre-service teachers' acceptance, confidence, and preparedness to use the Moodle LMS, the literature reviewed thus far has indicated that 'continued use', 'confidence in using', and 'preparedness to use' (Al Amoush & Sandhu, 2018) are new constructs that need to be investigated in the South African context. The other constructs were reported to have inconsistent results in various studies (Abdullah & Ward, 2016; Binyamin et al., 2019; Kim & Lee, 2020; Mutambara & Bayaga, 2020b; Ogden, 2003) and thus there is a need for a study to clarify these inconsistencies in the body of knowledge in the South African context. Based on the literature reviewed and the current knowledge of the researcher so far, Table 2.4 shows the variables that needed to be investigated in this research and some of the variables in the body of knowledge with inconsistent results that needed to be clarified, especially in the South African context.

Table 2.4: Summary of gaps in the body of knowledge

Theme	Gap in the body of knowledge	Variables to be examined	Reference
Continued use	Have not been examined in the South African context.	Continued use	Al Amoush and Sandhu (2018); Lim (2018)
		Confidence	Chitanana et al. (2008); List (2019)
		Preparedness	Gill and Dalgarno (2008); Chitanana et al. (2008)
		Perceived ease of use	Binyamin et al. (2019); Liu et al. (2010)
Behavioural intention	Inconsistences in the body of knowledge.	Perceived subjective norm	Abdullah and Ward (2016); Kim and Lee (2020); Sivo et al. (2018)
	Have not been examined in the South African pre-service teachers context.	Perceived resources	Ku (2009); Kim and Lee (2020); (Zarafshani et al., 2020)
		Perceived usefulness	Ku (2009); Binyamin et al. (2019)
		Perceived attitude	Ogden (2003); Šumak et al. (2011)
		Computer self-efficacy	Abdullah and Ward (2016); Ogden (2003)
Perceived usefulness	Inconsistences in the body of knowledge.	Perceived resources	Ku (2009); Saroia and Gao (2019)
		Perceived subjective norm	Kim and Lee (2020); Sivo et al. (2018)
		Perceived ease of use	Binyamin et al. (2019); Saroia and Gao (2019)
Perceived attitude towards use	Inconsistences in the body of knowledge.	Perceived usefulness	Teo and Milutinovic (2015); Mutambara and Bayaga (2020b)
		Perceived ease of use	Liu et al. (2009); Fang et al. (2019)
Perceived ease of use	Inconsistences in the body of knowledge.	Perceived resources	Ku (2009)
		Perceived subjective norm	Kim and Lee (2020); Sivo et al. (2018)
		Perceived usefulness	Lee (2010)
Subjective Norm	Inconsistences in the body of knowledge.	Perceived resources	Ku (2009)
		Perceived attitude	Ogden (2003); Šumak et al. (2011)
		Perceived usefulness	Lee (2010)

2.17 Chapter Summary

The aim of this study was to examine the factors that affect pre-service teachers' acceptance of the Moodle learning management system vis-à-vis the confidence and preparedness to use the resource at a rural university in South Africa. This chapter reviewed and chronicled the empirical evidence from other institutions in and outside South Africa. It started by elucidating on the meaning, types, and examples of an LMS baring out its features. It then focussed on the Moodle LMS, giving its advantages and disadvantages, as well as evidence of its adoption worldwide. The barriers to Moodle implementation and factors affecting the acceptance of the LMS were discussed. The effects of demographic factors on the acceptance of Moodle were examined. The chapter concluded by looking at the state of Moodle at the university and in the Faculty of Education (where pre-service teachers are schooled).

The next chapter examines theoretical literature which provides the foundation on which this study is anchored.

CHAPTER THREE

THEORETICAL FRAMEWORK

3.1 Introduction

This study examined pre-service teachers' acceptance and continued use of the Moodle learning management system in the context of a South African rural university. The chapter starts by presenting the theories of technology acceptance. That is, a chronological development of the main technology acceptance theories used to examine the acceptance of learning management systems in this study. These theories are namely; the theory of reasoned action (TRA), the theory of planned behaviour (TPB), and the technology acceptance model (TAM). The various extensions of the TAM that resulted in the modified TAM used in this study are also examined. The conceptual framework that underpins this study, as well as its associated hypotheses are also discussed herein. The summary to the chapter is presented lastly.

3.2 Theories of Technology Acceptance

This section reviews the chronological development of the three main technology acceptance models that are traditionally used in predicting technology acceptance behaviour, from the view point of this study. The theory of reasoned action (TRA), the theory of planned behaviour (TPB), and the technology acceptance model (TAM) and its various extensions (such as the TAM2) will be reviewed. These technology acceptance models are comprehensively interconnected and they went through demanding proofs over many years. The weaknesses of the earliest model led to the development of the next, thereby strengthening the ability to predict user acceptance.

3.2.1 Theory of Reasoned Action

The first theory to be examined is the theory of reasoned action (TRA). It is arguably one of the initial models developed to explain user acceptance of technology. The theory focusses on constructs or variables that are concerned with individual motivational factors as determinants of the likelihood of performing specific behaviours (Ajzen & Fishbein, 1980; Montaño & Kasprzyk, 2015). The theory was established to

predict and describe individuals' volitional behaviour and to understand their psychological determinants. It adopts that individuals are rational in nature and they will act based on the information available, with individuals' behavioural intentions being the main factor for their behaviour (Ajzen & Fishbein, 1980). The theory considers intentions as the main predictor of an individual's behaviour, where intention refers to a person's motivation to carry out a particular behaviour (Eagly et al., 2001).

Hale et al. (2002) expressed the TRA as a simplified equation written as $BI = (AB)W_1 + (SN)W_2$, where BI = one's behavioural intention, AB = one's attitude towards performing the behaviour, W = empirically derived weights, and SN = one's subjective norm related to performing the displayed behaviour. The weights were there to moderate the behavioural constructs per individuals' volitional tastes.

According to Fishbein and Ajzen (1975), personal influence and social influence were the two critical determinants of people's intentions. Personal influence characterises attitude, which denotes the positive or negative appraisals of the behaviour performed by the individual, while the social influence is a subjective norm, which is the degree to which people trust that the people who are important to them think they should or should not perform a particular behaviour (Ajzen, 1985). The weight of these two factors will differ based on the person performing the behaviour and on the intention being considered (Al-Aulamie, 2013).

According to the TRA model, attitude is formed throughout the person's salient beliefs about a specific action. Relevant beliefs attach a person's behaviour with the performance outcome. The individual's evaluation of the outcome, will determine the effect of attitude towards their behaviour. A person's attitude can therefore be estimated by the noticeable beliefs and the estimation of the situation outcome.

A subjective norm is the purpose of a belief where people will observe the social pressure from their group to perform the behaviour in question. Figure 3.1 clearly shows that beliefs and evaluations have direct influence on one's attitude towards a certain behaviour, and this in turn influences one's behavioural intentions. In contrast, normative beliefs have effects on subjective norms that in turn influences behavioural intentions. Actual behaviour is therefore a result of one's behavioural intentions.

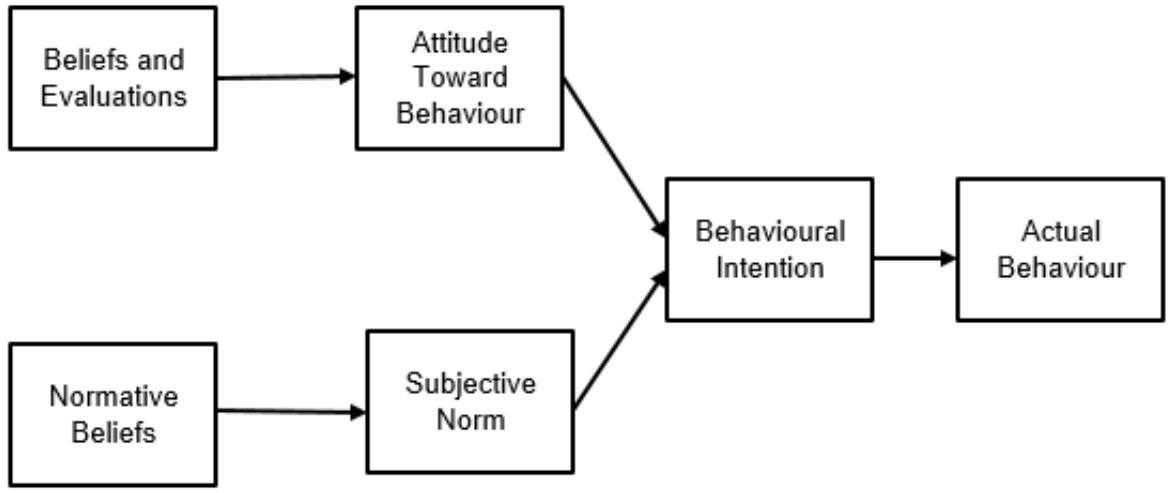

Figure 3.8: The theory of reasoned action (Fishbein and Ajzen (1975)

Inasmuch as the TRA is able to demonstrate that a behavioural intention measure will predict the performance of any voluntary act as validated by some researches (Ajzen & Fishbein, 1980; Montaño & Kasprzyk, 2015; Sheppard et al., 1988), it still has some glaring weaknesses. According to Terry et al. (1993), the TRA's major weakness is its inability to point to the connections between individuals and the broader social structures which govern social practice. The distinction of these two factors is ambiguous because an individual's beliefs, attitudes and understandings are a constituted activity (Terry et al., 1993).

Another weakness of the TRA is that it assumes only two latent constructs of behavioural intentions, namely attitude and subjective norm. Schwartz and Tessler (1972) noted that there exists other determinants of intentions that go beyond attitude towards the behaviour and subjective norms. Such determinants include people's sense of right and wrong, and the beliefs surrounding moral obligation (Schwartz & Tessler, 1972). Bagozzi (1981) also added that intention appears to have a direct effect on behaviour in the short term only.

Another weakness is that the TRA fails to recognise that social change may be generational rather than the sum of individual change (Terry et al., 1993). Also, the model focuses on analytic truth rather than synthetic one, and therefore the conclusions resulting from those applications are often true by definition rather than by observation (Ogden, 2003).

The purpose of the current study was to examine the factors that affect pre-service teachers' acceptance, confidence, and preparedness to use the Moodle learning management system at a rural university in South Africa. Some of the factors or constructs identified in chapter 2 as central to the needs of the rural university under study are perceived resources; continued use of the LMS; confidence to use the Moodle LMS; and preparedness to use the Moodle LMS, which are all not catered for by the TRA. This means that this study could not make use of this theory to examine pre-service teachers' acceptance of the Moodle LMS because it has limited constructs.

The TRA emphasises users' volitional behaviour. This means that users of the technology can only exhibit a certain behaviour if they feel like doing it or have an intention to do so. In the context of this study, this may not always be the case, since pre-service teachers may have no other option but to use the Moodle LMS. For instance, during the Covid-19 pandemic, all learning at the institution moved to the online platform in a bid to encourage minimum contact and to practise social distancing without compromising the academic project. In this case, the TRA could not be the technology acceptance theory of choice.

The fact that the TRA fails to recognise that social change may be generational, rather than the sum of individual change (Terry et al., 1993), contradicts social dynamics that are inherent at institutions of higher learning. Most of the pre-service teachers at universities nowadays are digital natives or 'generation Z' (Kirschner & De Bruyckere, 2017), meaning that they were born within the technology era and they may be able to use technology effectively in order to meet their needs, learning included. The TRA's failure to recognise the generational change in societies like universities makes it fail to fully meet the needs of this study.

3.2.2 The Theory of Planned Behaviour

To counter the weaknesses of the TRA, Ajzen (1985) proposed the theory of planned behaviour (TPB). To this effect, Ajzen simply added the perceived behavioural control construct to the constructs of the TRA, as an additional determinant of users' behavioural intentions and actual behaviour (Ajzen, 1985; Madden et al., 1992). The perceived behavioural control is defined as individuals' assessment of the easiness on performing a specific behaviour based on their control beliefs (Ajzen, 1985). The theory assumed that an individual's behaviour is determined by the intention to

perform a particular behaviour, and that the intention is jointly affected by the individual's attitude and subjective norm towards the behaviour, although one of the confines of TRA was that behaviour should be under the individual's volition (Ajzen, 1985; Ku, 2009). Ajzen (1985) also expounded that some other factors regarding the particular behaviours, such as time, money, and skills, also influenced the act of those behaviours. It was additionally found that individuals' confidence regarding their ability to perform a particular behaviour directly influences the actual behaviour (Bandura et al., 1977; Bandura et al., 1980). The TPB model is shown in Figure 3.2.

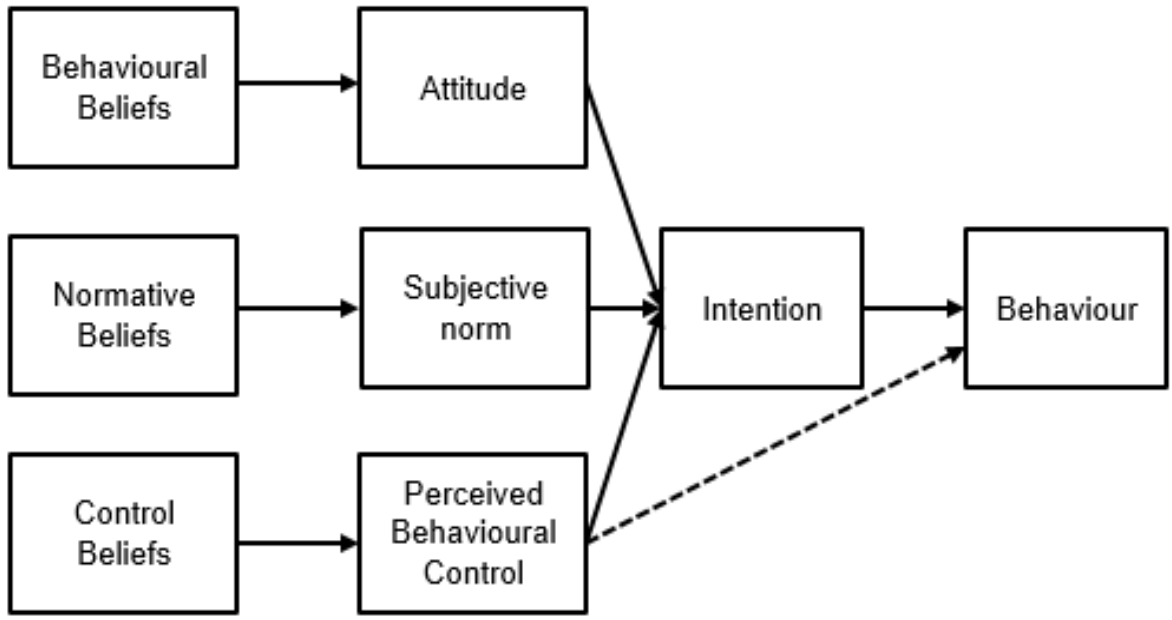

Figure 3.9: The theory of planned behaviour (Ajzen and Fishbein (1980)

The TPB became popular in explaining individuals' beliefs towards certain behaviours (Ku, 2009). Many studies concurred that the constructs of TPB has the explanatory power to predict human behaviours in accepting the use of technologies in different fields (Ajzen, 1991; Armitage & Conner, 2001; Godin & Kok, 1996; Mathieson et al., 2001). Just like its predecessor, the TPB has several criticisms; there were inconsistent roles in the constructs of attitudes, subjective norms, and perceived behavioural control (Ogden, 2003).

In response to Ogden (2003), Ajzen and Fishbein (2004) argued that the importance of those constructs may vary, or even may not be necessary, depending on the different situations, populations, and behaviours. Mathieson et al. (2001) weighed in

with a suggestion that customized instruments were needed when adopting TPB research into every different circumstance.

The heaviest criticism was by Sharma and Kanekar (2007) who stated that TPB may not be appropriate for the studies focused on the behaviour modification because the constructs of TPB do not provide the explanation on behaviour change over time (Ku, 2009).

To examine the factors that affect pre-service teachers' acceptance, confidence and preparedness to use the Moodle LMS at a rural university in South Africa, the TPB cannot be used as a technology acceptance model primarily because it does not address some of the factors or variables of this study. These variables are perceived resources, continued use of the Moodle LMS, preparedness to use the Moodle LMS and confidence in using the LMS. The fact that there were inconsistent roles in the constructs of attitudes, subjective norms, and perceived behavioural control (Ogden, 2003) means that this theory cannot be decisively used to predict pre-service teachers' acceptance of the Moodle LMS.

The observation by Sharma and Kanekar (2007) that the TPB may not be appropriate for studies focused on behaviour modification because the constructs of the TPB do not provide explanation on behaviour change over time also nullifies the ability of this theory from use in this study.

3.2.3 Technology Acceptance Model

The weakness of the TRA is that it only applies to volitional behaviour (Yousafzai et al., 2010) and that of the TPB is that the predictors of behavioural intention are not confined to the proposed three variables of attitude, subjective norms, and perceived behavioural control (Ajzen, 1991). Davis (1985) modified the TRA by proposing a robust model called the technology acceptance model (TAM). The TAM was developed to predict and explain user acceptance of certain types of computer-based information systems (Davis, 1985, 1989; Davis et al., 1989). The model suggests that there are two variables that determine an individual's behavioural intention to use a particular technology, namely perceived usefulness (PU) and perceived ease of use (PEOU) (Davis, 1985). PU refers to the degree to which a user believes that using a particular information system would enhance job performance and PEOU refers to the degree to which a user believes that using a particular information system would be free of effort (Davis, 1985, 1989). Both Ku (2009) and Al-Aulamie (2013) concurred

that the TAM adopted the same assumptions of users' attitude towards using (ATT), behavioural intentions to use (BI) and actual behaviour of information system use (ASU) from the TRA. Linkages in the TAM variables are shown in Figure 3.3.

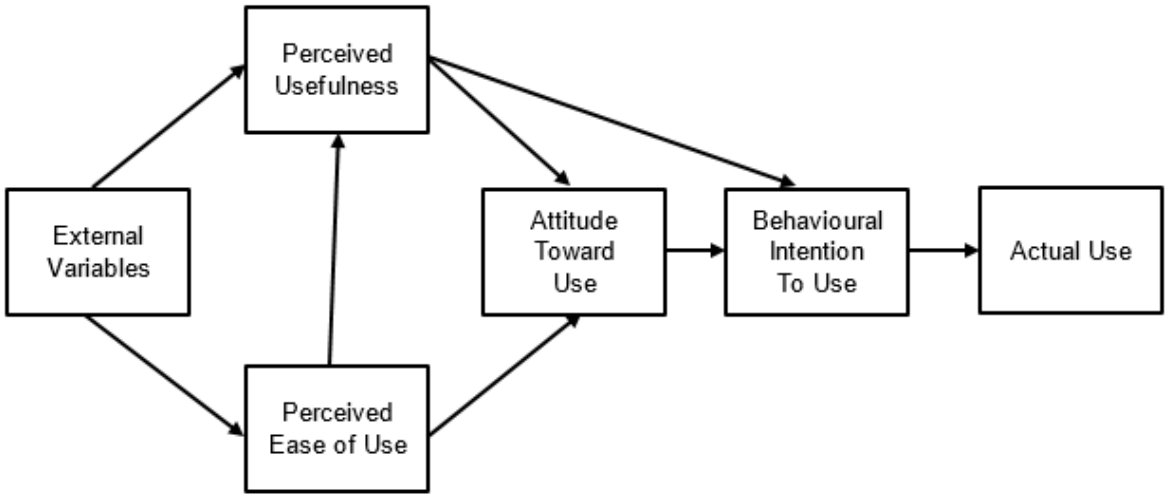

Figure 3.10: Technology acceptance model (Davis et al., 1989)

According to Venkatesh (2000), the TAM is one of the most commonly applied models for predicting and explaining usage intentions and acceptance behaviours in many information systems. For a long time, the TAM has been accepted as a valid and robust model for predicting the acceptance of information systems in numerous workplace systems and in academia (Al-Aulamie, 2013; Davis, 1989; Davis et al., 1989; Ku, 2009; Mathieson et al., 2001; Mutambara & Bayaga, 2020b; Venkatesh, 2000; Venkatesh & Davis, 2000). To strengthen this assertion, empirical evidence from Venkatesh and Bala (2008) also indicated that the TAM consistently explained about 40% of the variance in individuals' behavioural intentions to use a particular information system. However, other researchers found that both perceived usefulness and perceived ease of use have minimal effects on the other constructs in TPB (Mathieson, 1991; Taylor & Todd, 1995).

In one of the seminal studies on the TAM, Davis (1989) discovered the existence of external variables that represent individual variances, situational limitations and organisationally controllable interventions that would be significant determinants on PU, PEOU, and BI of using the system (Ku, 2009). Such external variables became the basis on which various extensions of the TAM were possible. The extensions allowed the TAM to be applicable in almost any field; the additional external variables

could be system structures, training, certification, and user support (Chau, 1996; Davis, 1989; Ku, 2009).

After the studies by Davis (1985, 1989), other studies were conducted to try and validate the TAM. A study by Tselios et al. (2011) used TAM to explore the variation of students' perceptions before and after the actual use of the Moodle LMS, and to liken students' acceptance between blended and distance learning. Their results showed that TAM constructs were significant and that perceived usefulness was the most robust determinant of students' behavioural intention, with an explanatory power of 39%. This means that students' acceptance of the Moodle LMS in blended and distance learning were found to be significant.

In Sweden, Jung et al. (2008) applied the TAM to examine students' acceptance of the Fronter LMS. The study included the attitude variable in the model, even though this variable was found to be insignificant in earlier studies (Davis, 1989; Venkatesh & Bala, 2008). The results showed that PU and PEOU were significant in predicting students' behavioural intention, with an explanatory power of 31%. In another study carried out on Malaysian students, Wong et al. (2013) investigated the integration of information technology in teaching and learning. The attitude variable was also included in their model to mediate the relationships from PU and PEOU towards behavioural intention. Their results upheld the significance of the TAM constructs, with an explanatory power of 37.3%.

Even though the TAM was a better measure of behavioural intension than TRA and TPB, it still exhibited undeniable limitations. One such a limitation was that the TAM measured the variables at a particular point in time thereby assuming that people's beliefs are static at that time. This may not be entirely correct because people's beliefs and intentions change over time and the forming of beliefs and intentions require a period of time (Davis, 1985; Lee et al., 2003). Another limitation was that the TAM exhibited a low explanatory power which was consistently around 40%, especially for studies that did not consider any external variables other than the original constructs (Davis et al., 1989; Venkatesh & Bala, 2008; Venkatesh & Davis, 2000). Another cause for concern was the fact that the main relationships between the TAM constructs were erratic. For instance, the relationship between PEOU and BI was reported statistically significant in some studies (Davis et al., 1989; Davis & Venkatesh, 1996; Venkatesh,

2000; Venkatesh & Davis, 2000) while not significant in other studies (Davis et al., 1992; Park, 2009; Venkatesh & Morris, 2000).

Despite its weaknesses, the TAM was widely accepted and considered as a robust model used to predict information technology acceptance over time (Mutambara & Bayaga, 2020b; Venkatesh, 2000; Venkatesh & Davis, 2000). This is one of the main reasons why this model was preferred and chosen for this study. In examining the factors that pre-service teachers consider important when accepting the Moodle LMS the researcher was looking for a tried and tested model that would precisely capture and explain the chosen variables. The fact that the TAM gives the researcher the chance to choose suitable external constructs that apply to the context of the current study also made this theory more attractive. Therefore, this study used the TAM to examine pre-service teachers' acceptance, confidence and preparedness to use the Moodle LMS at a rural University in South Africa.

However, the model could not be used in its original form to examine the factors that affect pre-service teachers' acceptance, confidence and preparedness to use the Moodle LMS at a rural University in South Africa. This is mainly because, in its original form, the TAM does not include some of the variables intimate to this study. Such variables as continued use of the Moodle LMS, preparedness to use the Moodle LMS, and confidence to use the Moodle LMS were not captured. Moreover, in its original form, the TAM exhibited a low explanatory power of around 40% (Venkatesh & Davis, 2000). Using such a model in this study would mean that the identified factors that affect pre-service teachers' acceptance, confidence, and preparedness to use the Moodle LMS at a rural university in South Africa only explain 40% of the variance of actual use. This means that 60% of the variance to actual use is explained by factors that are not within the model, which is not acceptable. Furthermore, the inconsistences within relationships within the TAM (Ogden, 2003) also points to the fact that the theory cannot be used for this study in its original form. Some adjustments to the original TAM had to be made following recommendations from other scholars.

Other researchers noted that the explanatory power of the TAM was affected by many external factors, such as type of participants, study situation, and availability of resources, to mention but a few (Davis et al., 1989; Sun & Zhang, 2005). In order to minimise the effects of the TAM limitations, Sun and Zhang (2005) noted that the explanatory power of TAM can be enhanced by adding more external variables to the

TAM. Davis et al. (1989) also suggested that there would be need for future studies into the employment of more external variables. This assertion gave rise to a plethora of extended TAM models, including the current study which added three external variables on either end of the original TAM.

3.2.4 Extended Technology Acceptance Models

In a bid to examine the factors that affect pre-service teachers' acceptance, confidence, and preparedness to use the Moodle learning management system at a rural university in South Africa, this study used the TAM in its extended version. Before exploring the current research's extended model, an overview of other extended TAM models used by scholars past is detailed. This is done to give more theoretical grounding to this study.

3.2.4.1 The Extended Technology Acceptance Model (TAM2)

Recognising the need to add more external variables linked to PU and PEOU towards behavioural intention as suggested by Davis et al. (1989), Venkatesh and Davis (2000) proposed the extended TAM (TAM2). This extended model included the experience variable and latent variables from social influence processes (SIP) (subjective norm, voluntariness, images) being social forces that influence users' decisions to accept or reject the LMS, and cognitive instrumental processes (CIP) (job relevance, output quality, result demonstrability) being interrelated factors (Venkatesh & Davis, 2000). The results, from four longitudinal data sets across various industries and information systems, showed that both SIP and CIP had consistent effects on users' perceived usefulness, behavioural intentions, and actual use. It was also noted that intention to use was significantly affected by the subjective norm variable ($\beta=0.44$; $p<0.001$), which showed more influence on intention to use than the effects from PEOU. The overall explanatory power of TAM2 was about 60%, meaning that the variation in user intention was captured by the factors identified in the model and only 40% was caused by other factors outside the model (Venkatesh & Davis, 2000). The subjective norm (SN) construct was identified as one of the critical variables among pre-service teachers at an institution of higher learning in a rural setting in South Africa. This is because pre-service teachers tend to behave in a certain way because their peers are doing it.

3.2.4.2 The Modified TAM Incorporating Computer Self-Efficacy

In addition to the variables of the TAM (i.e. PU, PEOU, usage), Igbaria and Iivari (1995) incorporated four more variables to the extended TAM, namely self-efficacy (SE), computer anxiety (CA), computer experience (CE), and organisation support (OS). It was proposed that all four variables affect PU, PEOU, and usage. The results showed that all four variables, SE, CA, CE, and OS, significantly affected PEOU (with 26% explanatory power), and that CA, CE, OS, and PEOU significantly affected PU (with 30% explanatory power). Only CE and PU showed direct effect towards usage.

A similar study, based on the TAM, was conducted by (Pan, 2003) on the WebCT system at a public university. To the basic constructs of the TAM, (Pan, 2003) added subjective norm (SN) and computer self-efficacy (CSE) and proposed that SN directly affects attitude towards WebCT (ATT) and usage, while CSE directly affects PEOU and usage. The results showed that SN indeed had a direct effect on PU, PEOU, and ATT, while CSE directly affected PU, PEOU, and usage. Additionally, PEOU directly affected PU and ATT; PU directly affected ATT; and ATT directly affected usage.

As indicated in section 3.3.4.1, the subjective norm (SN) has been identified as one of the very important constructs of this study. Computer self-efficacy (CSE) has also been identified as one of the cornerstone constructs of this study. Pre-service teachers' CSE is critical in the sense that it gives a good measure of their estimated ability to use computer technologies. This ability in turn feeds into the pre-service teachers' acceptance of the Moodle LMS.

3.2.4.3 The Extended TAM with Perceived Resources

The variable perceived resources (PR) was considered by researchers as important to users when they consider adopting a particular information system (Ajzen, 1991; Mathieson, 1991; Venkatesh, 2000). Resources refer to the personal and organisational resources needed by users of a particular information system (Mathieson et al., 2001). The variable PR was incorporated into the extended TAM by Mathieson et al. (2001) to examine the voluntary use of the Institute for Management Accountants (IMA) bulletin board system (BBS). The results of this study indicated that PR had an effect on a user's PEOU, BI, and to a smaller extent on PU. It was therefore concluded that promoting PR would result in a better degree of acceptance of given LMS. This construct was considered essential for this study because pre-service

teachers need the resources that they can use to access and use the Moodle LMS. The resources could include their personal resources and/or institutional resources such as infrastructure.

Exploring other factors external to the TAM generated a lot of interest among researchers in search of a robust model that could explain the acceptance of information technology by users. Various external factors were investigated across various industries and sectors. All extensions assumed the basic TAM whose variables were perceived usefulness (PU) and perceived ease of use (PEOU), both explaining behavioural intention to use (BI) and then actual use (AU) of a given information system. The results of some of the studies whose explanatory powers are known, are enumerated in Table 3.1.

Table 3.5: Explanatory powers of various extended TAMs

Study	Variables studied	Explained variance in		
		PEOU	PU	BI
Hsia (2007)	Computer self-efficacy; perceived control.			33%
Liu et al. (2010)	Online course design; user interface design; previous online learning experience; perceived interaction.	70%	59%	76%
Al-Harbi (2011)	Social influence; institutional influence; system characteristics; individual characteristics.			43%
Amin et al. (2016)	Self-efficacy.	30.7%	22.9%	43.3%
Nikou and Economides (2017)	Facilitating conditions; personal innovativeness; perceived ubiquity value; mobile self-efficacy; mobile device anxiety, content; user interface, cognitive feedback; perceived trust.	62.8%	81.4%	46.8%
Sánchez-Prieto et al. (2019)	Perceived enjoyment; compatibility; subjective norm	21.3%	62%	70.8%
Mutambara and Bayaga (2020b)	Perceived social influence; perceived psychological readiness; perceived enjoyment; perceived resources	8.7%	12.6%	40.8%

Antecedent to the theoretical underpinnings of the extended TAM models here discussed, this research employs three external variables (subjective norm, computer self-efficacy, and perceived resources) that feed into the original TAM (PEOU, PU, ATT, and BI). The other three variables (continued use, preparedness to use the Moodle LMS, and confidence in using the Moodle LMS) affect the original TAM *a posteriori*. It is hoped that these variables will succinctly capture the factors that affect pre-service teachers' acceptance of the Moodle LMS at the institution under consideration.

3.3 The Proposed Model

The proposed model for this study is based on some of the constructs/variables identified in the reviewed literature and from other researchers' theoretical frameworks presented in section 3.2. The identified 11 constructs are presumed adequate and sufficient to explain pre-service teachers' acceptance, confidence, and preparedness to use the Moodle learning management system at a rural university in South Africa. The model variables are discussed herewith.

3.3.1 The Model Variables

Following the recommendation by Davis et al. (1989) that more external variables to the TAM should be explored, a plethora of other studies were conducted to that effect and in various fields(Abdullah & Ward, 2016; Amin et al., 2016; Igbaria & Iivari, 1995; Mathieson et al., 2001; Mutambara & Bayaga, 2020b; Venkatesh & Davis, 2000). This study used an extended TAM to investigate pre-service teachers' acceptance, and preparedness to use the Moodle LMS at a rural university in South Africa.

The preceding literature review in information technology acceptance assisted in identifying the relevant external factors required for this study. All the external variables were chosen because of their relevance to pre-service teachers' needs, especially applicable to the community under study. Some of the variables were chosen in order to resolve inconsistences found in the past results (Ogden, 2003).

The 11 variables identified for this research were divided into three groups. The first group consists of the three external variables that were added to the original TAM *a priori*, being pre-service teachers' subjective norm (SN), computer self-efficacy (CSE),

and perceived resources (PR). The second group consists of the five original TAM variables, being perceived ease of use (PEOU) of the Moodle LMS; perceived usefulness (PU) of the Moodle LMS; attitude towards (ATT); behavioural intention to use (BI) the Moodle LMS; and actual use (AU) of the Moodle LMS. The third group consists of three new variables that extend the old TAM *a posteriori*, being continued use (CU) of the Moodle LMS; confidence (CON) in using the Moodle LMS; and preparedness (PPD) to use the Moodle LMS. These variables, also called latent constructs or simply constructs, constitute the proposed South African rural universities technology acceptance model (SARUTAM).

3.3.2 The SARUTAM

The South African Rural Universities Technology Acceptance Model (SARUTAM), an extension of the original TAM, was proposed to explain pre-service teachers' acceptance, confidence and preparedness to use the Moodle LMS in the context of a South African rural university. This was done with the intention to understanding the factors that drive pre-service teachers to accept the use of learning management systems in general, and the use of the Moodle LMS in particular, since it is the LMS of choice at the university under study. The use of LMSs are now more crucial more than ever, especially now that everyone is encouraged to maintain good social distancing as a consequence of the Covid-19 pandemic.

The model has 11 constructs, as explained in section 3.3.1. Of these, five of them are from the original TAM. It identified three external constructs that were chosen from the body of literature because of their presumed ability to explain users' acceptance of a given information system, which is hoped to improve the explained variance of the overall model. The other three were added at the end of the original TAM to explain what could happen after the acceptance of the technology (the Moodle LMS). The conceptual framework is shown in Figure 3.4, and the explanation of constructs follow thereafter, starting with the three external factors feeding into the original TAM, followed by the five original TAM factors and lastly the three additional factors.

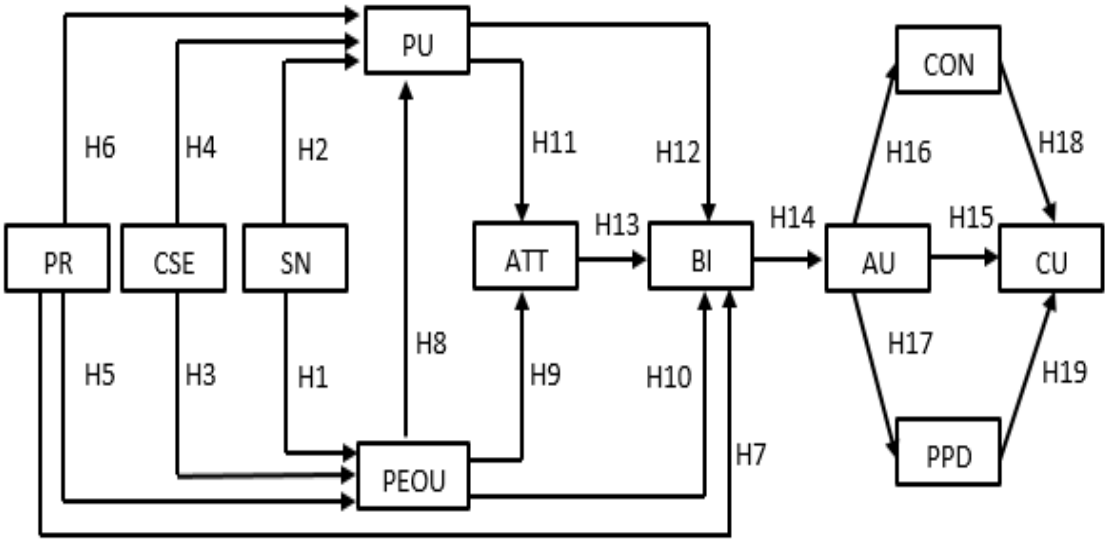

Figure 3.11: The proposed South African rural universities technology acceptance model (SARUTAM)

3.3.2.1 Subjective Norm (SN)

In some scholarly circles subjective norm (SN) is referred to as social influence (SI) because they mean the same thing, and can be used interchangeably (Kim & Lee, 2020; Tarhini et al., 2014). This variable refers to the degree of individual attention that is influenced by the significant others' opinions while taking a particular decision, which shapes the performance of a particular behaviour (Al-Okaily et al., 2020; Venkatesh & Davis, 2000; Zarafshani et al., 2020). The impact of SN on the constructs of TAM in e-learning has been widely considered in the literature.

Tarhini et al. (2014) noted that findings were moderately contradictory. By investigating various researches that employed the SN construct, Tarhini et al. (2014) found that 19 out of 22 (86%) studies showed that SN has a favourable influence on PU. Abdullah and Ward (2016) also found that four out of six (67%) studies showed SN having a positive influence on PEOU.

The effect of SN on PU of e-learning was demonstrated by Ramírez Anormaliza et al. (2016) to be positive, but in contradiction with the results of Kanwal and Rehman (2017) which was negative. Further contradictions were seen in a study by (Park, 2009), which concluded that SN affects PU of e-learning systems but does not affect

PEOU. Across nations, Baker et al. (2010) found that SN affected usage of technologies in developing countries more than in developed countries.

The literature has demonstrated that subjective norm is a very important construct in determining users' acceptance of information systems. Likewise, this construct is key to this study where it is interpreted in such a way that pre-service teachers will perform the behaviour of using the Moodle LMS simply because a significant other is doing it. This means that pre-service teachers with high SN are more likely to use the Moodle LMS. The SN construct was also included in this study in a bid to mitigate one of the weaknesses of the TAM, that the model fails to address the SI factors that affect users' behavioural intentions (BI) and actual use (AU) of the information system under investigation, as purported by Bagozzi (2007) and Binyamin et al. (2018).

To test for the influence of SN on pre-service teachers' acceptance, confidence, and preparedness to use the Moodle LMS, it was assumed that the effect is indirectly cascaded via PEOU and PU. Hence, the following hypotheses were proposed:

H1: Pre-service teachers' subjective norm has a positive effect on perceived ease of use of the Moodle LMS.

H2: Pre-service teachers' subjective norm has a positive effect on the perceived usefulness of the Moodle LMS.

H7: Pre-service teachers' subjective norm has a positive effect on their attitude towards use of the Moodle LMS.

3.3.2.2 Computer Self-Efficacy (CSE)

Computer self-efficacy (CSE) was the first construct most widely used as an extension to the original TAM (Abdullah & Ward, 2016), and it measures people's perceptions of their ability to use computer technologies (Compeau & Higgins, 1995; Nikou & Economides, 2017; Zarafshani et al., 2020). This means that if people feel that they have a good capability to use computer technologies, they are more likely to use the information system. Venkatesh and Davis (1996) introduced CSE into the TAM as a determinant of perceived ease of use (Holden & Rada, 2011).

In this study, CSE will be taken to mean pre-service teachers' belief that they are able to use all the computer infrastructure that is necessary for them to fully utilise the Moodle LMS provided by their institution.

Tarhini et al. (2014) once again observed that CSE was adopted broadly into TAM-related studies in e-learning and the findings remained very inconsistent. For instance, Abdullah and Ward (2016) conducted a quantitative meta-analysis of 107 studies in e-learning adoption and discovered that 63% of the studies found a positive influence between CSE and PU and 80% of them found a positive influence between CSE and PEOU. In the studies of developing countries, it was found that CSE influences PEOU of e-learning but does not affect PU (Boateng et al., 2016; Kanwal & Rehman, 2017; Ramírez Anormaliza et al., 2016). Ma et al. (2013) concluded that CSE does not influence PU of e-learning systems.

The preceding literature clearly demonstrates the importance of the CSE construct in early studies, though with inconsistent results. Likewise, this construct has been included in this study partially because of its importance in past studies vis-à-vis in pre-service teachers' acceptance, confidence, and preparedness to use the Moodle LMS and partially as an attempt to try and resolve the inconsistences in past studies.

To test the influence of CSE on pre-service teachers' use of the Moodle LMS, the following hypotheses were proposed:

H3: Pre-service teachers' computer self-efficacy has a positive effect on perceived ease of use of the Moodle LMS.

H4: Pre-service teachers' computer self-efficacy has a positive effect on perceived usefulness of the Moodle LMS.

3.3.2.3 Perceived Resources (PR)

Perceived resources (PR) refers to the degree to which an individual believes that an organisational and technical infrastructure exists to support the use of the given information system (Kim & Lee, 2020; Venkatesh et al., 2003; Zarafshani et al., 2020). In the context of this study, the resources that affect pre-service teachers' use of the Moodle LMS include: university infrastructure, internet connection, digital content, mobile data, electronic devices, and university ICT equipment.

Pre-service teachers who possess the relevant devices, financial resources, internet connection, and the required skills for online learning are most likely to be psychologically ready to use the Moodle LMS. This was supported by Erlich et al. (2005) who found that students who were not familiar with using computers before

enrolling for an online course reported more frustration and anxiety compared to those who were used to computers. Kunda et al. (2018) also found that the availability of resources, such as wireless access points, access to computer equipment in classrooms and laboratories, had a positive effect on users' decisions to accept ICTs in education.

In a study by Ku (2009) on the relationship between PR and PU, the results showed a significant coefficient (β= 0,208; p<.05) in a pre-test and (β=0,107; p<.05) in a post-test, thereby concluding that the research data partially supports the hypothesis that PR has a positive effect on PU. Ku (2009), however, stated that more research would be needed to clarify the relationship between PR and PU. On the relationship between PR and PEOU, Ku (2009) found a significant coefficient (β=0,347; p<.05) in the pre-test and (β=0,564; p<.05) in the post-test, thereby concluding that PR has a positive effect on PEOU. On the relationship between PR and attitude (ATT), Ku (2009) found that PR does not directly influence ATT towards use of the LMS. Based on the study by Ku (2009), it may be assumed that if pre-service teachers are provided with the necessary resources needed, they will have a positive feeling about the use of the Moodle LMS, which in turn has a positive effect on their acceptance of the LMS.

Considering the need to further clarify the relation between PR and PU, this study hypothesised that:

H5: Pre-service teachers' perceived resources have a positive effect on perceived ease of use of the Moodle LMS

H6: Pre-service teachers' perceived resources have a positive effect on behavioural intention to use the Moodle LMS

3.3.2.4 Perceived Ease of Use (PEOU)

Perceived ease of use (PEOU) refers to the extent to which users believe that the use of a given information technology would be free from effort (Mutambara & Bayaga, 2020b; Zarafshani et al., 2020).

In this study, PEOU was considered as one of the cornerstone constructs that is assumed to have a positive effect on pre-service teachers' acceptance of the Moodle LMS. This is because the study assumes that pre-service teachers have a belief that

using the Moodle LMS will be fairly easy for them. This construct stands out as one of the pillars of the original TAM by Davis et al. (1989).

In subsequent studies (Davis, 1989; Saroia & Gao, 2019; Sivo et al., 2018; Šumak et al., 2011), PEOU was found to have an impact on a user's belief about PU when using an information system as well as on behavioural intention (Binyamin et al., 2018; Lee, 2006; Mutambara & Bayaga, 2020b). PEOU was also found to have influences on users' attitude towards the use of an information system (Saroia & Gao, 2019; Sivo et al., 2018). A positive link between PEOU and PU was also found in several studies (Lee, 2010; Liu et al., 2009; Mutambara & Bayaga, 2020b; Šumak et al., 2011; Zhang et al., 2008). However, there are some inconsistences in the body of knowledge on the effect of PEOU on PU. Studies by Teo and Milutinovic (2015) and Sivo et al. (2018) reported that PEOU had a significant effect on PU, while Saroia and Gao (2019) reported that the relationship was not significant. These inconsistences in the body of knowledge have forced the current study to further investigate the effect of PEOU on PU.

It was, therefore, hypothesised that:

H8: Pre-service teachers' perceived ease of use has a positive effect on perceived usefulness of the Moodle LMS.

H9: Pre-service teachers' perceived ease of use has a positive effect on their attitude towards use of the Moodle LMS.

H10: Pre-service teachers' perceived ease of use has a positive effect on behavioural intention to use the Moodle LMS.

3.3.2.5 Perceived Usefulness (PU)

Perceived usefulness (PU) refers to the belief that the use of a given information technology can improve performance (Davis, 1989; Sivo et al., 2018; Venkatesh, 2000). It has been touted as the main precondition for behavioural intention (BI) and information system acceptance in many fields because users usually look to predicting the degree of benefits to be gained by accepting the technology (Kim & Lee, 2020). Likewise, PU has been another very important construct in this study because pre-service teachers tend to emphasise the possible benefits they are likely to get from using the Moodle LMS. Many studies have used the PU construct to explain user

acceptance of information technologies. The positive effect between PU and BI was found in different studies (Lee, 2010; Liu et al., 2009; Šumak et al., 2011; Zhang et al., 2008). It was also shown that PU has a positive effect on ATT (Lee, 2010; Lee et al., 2005; Liu et al., 2009; Ngai et al., 2007).

However, there are some contradictions in the body of knowledge on the effect of PU on both BI and ATT towards the acceptance of information technologies. Saroia and Gao (2019) found that PU influences both ATT and BI to use an information system, while Teo and Milutinovic (2015) reported that it only influences ATT but not BI. All the same, the PU construct is too important to have been left out in this study given its historical importance to other studies. Furthermore, this study intended to contribute a finding on the contradictions reported in other studies. Therefore, it was hypothesised that:

H11: Pre-service teachers' perceived usefulness has a positive effect on their attitude towards using the Moodle LMS.

H12: Pre-service teachers' perceived usefulness has a positive effect on their intention to use the Moodle LMS.

3.3.2.6 Attitude Towards Use of the Moodle LMS (ATT)

Attitude (ATT) towards the use of a given technology was defined by Fang et al. (2019) as the user's feelings and views towards that technology. Such feelings are captured in such attribute dimensions as good-bad, harmful-beneficial, pleasant-unpleasant, and likable-dislikable (Ajzen, 2001; Šumak et al., 2011). This was cemented by (Mutambara & Bayaga, 2020b) that thoughts and feelings play a very important part in the acceptance of a given information system. In this study, ATT towards use of the Moodle LMS by pre-service teachers is also very important because it captures how they feel about the use of the resource which is provided freely by the university. Their BI can be caused by their feelings about the Moodle LMS itself, whether they like it or not, or whether they feel pleasant when using it, or whether they want to replace it with a new one. Liu et al. (2009) and Lee et al. (2005) separately found that ATT directly influences BI. The same results were reported in many more studies (Fang et al., 2019; Nikou & Economides, 2017; Teo & Milutinovic, 2015).

For this study, this means that if pre-service teachers have a positive attitude towards the Moodle LMS it enhances their behavioural intention to accept the resource and improve their performance. It was, therefore, hypothesised that:

H13: Pre-service teachers' attitude towards the MLMS will have a positive effect on their intention to use the Moodle LMS.

3.3.2.7 Behavioural Intention to Use (BI)

Behavioural intention (BI) refers to a person's cognitive readiness to perform a given behaviour and it is assumed to be an immediate antecedent of behaviour (Fang et al., 2019). It is considered the most significant determinant of a person's behaviour that directly affect the use of an information technology (Kim & Lee, 2020). Similarly, BI is envisaged to be integral in this study since pre-service teachers' behavioural intentions are a precursor of the actual use (AU) of the Moodle LMS concerning their acceptance of the technology.

The results from existing studies have shown that BI is a determinant of the actual use of an information system in various fields of study (Šumak et al., 2011; Yi-Cheng et al., 2007; Zhang et al., 2008). This was supported by recent studies that emphasised the same outcome that that users' behavioural intention to information technologies in education influences their actual usage (Graham et al., 2020; Sivo et al., 2018; Zarafshani et al., 2020). Likewise, in this study it is envisaged that pre-service teachers' behavioural intention to use the Moodle LMS has an effect on their actual use of the resource. It was, therefore, hypothesised that:

H14: Pre-service teachers' behavioural intention has a positive effect on their actual use of Moodle LMS.

3.3.2.8 Actual Use of the Moodle LMS (AU)

In this study, actual use (AU) of the MLMS refers to the situation where pre-service teachers were exposed to the software and allowed to interact with it during active and passive learning. In this model, it follows directly after behavioural intention to use and it informs the confidence to use, the preparedness to use and the continued use variables. In a paper by Davis et al. (1989) to explain user acceptance of computer technology, one of the research praxis was to find out how well intentions predict

usage. The results showed that the intention to usage correlation was 0.63, which was a very strong relationship.

In a different study, Hernandez et al. (2011) attempted to identify the social motivations that underlie learners' attitudes and usage behaviour of ICT interactive tools. They found that usage of ICT had a 45.6% explanatory power, meaning that the factors captured in their model to predict usage only explained 45.6% of the use variance. The rest of the 55.4% was explained by other factors not in the model.

In this study, AU is influenced by the TAM constructs through BI. Consequently, the impact of pre-service teachers' actual use of the Moodle LMS was expected to cascade to continued use of the resource to improve performance. It was hypothesised that:

H15: Pre-service teachers' actual use of the Moodle LMS has a positive effect on their continued use of the Moodle LMS.

H16: Pre-service teachers' actual use of the Moodle LMS has a positive effect on their confidence in using the Moodle LMS.

H17: Pre-service teachers' actual use of the Moodle LMS has a positive effect on their preparedness to use the Moodle LMS.

3.3.2.9 Confidence in Using the Moodle LMS (CON)

The confidence (CON) construct was specifically coined for this study to ascertain whether pre-service teachers are confident in using the Moodle LMS as they continue to use it in their studies. The construct was envisaged to derive from the actual use construct and then impact the continued use construct. In the body of knowledge "confidence in using" is hardly mentioned as a construct, except in instances where researchers have mentioned, in passing, that users were confident in using the Moodle LMS or not (Hajjar, 2015; List, 2019; Reisoğlu & Çebi, 2020; Sadaf et al., 2012).

In a study on explaining how digital competences of pre-service teachers can be developed, Reisoğlu and Çebi (2020) reported that pre-service teachers' self-confidence in the use of technology increased with the benefit of applications in the training. While exploring pre-service teachers' beliefs about using Web 2.0 technologies, Sadaf et al. (2012) found that pre-service teachers reported moderate

confidence for using Web 2.0 technologies. List (2019) also reported that students expressed a great deal of confidence in their own digital literacy.

In a study carried out at Ahlia University in the Kingdom of Bahrain concerning interest in how the use of Moodle would sustain, improve and develop student's learning in higher institutions, Hajjar (2015) reported that 100% of the faculty members expressed self-confidence in their skill to use Moodle, and that the majority of the students (75%) showed significant confidence in their capability to use Moodle.

On the issue of confidence to use technologies in education it is not all positive though. In an investigation to identify the opportunities and challenges of using e-learning in Zimbabwe (a developing country like South Africa), Chitanana et al. (2008) testified that a significant number of users lacked confidence in the use of e-learning platforms.

The antecedent facts about user confidence around ICTs gives a promise of hope in developing this construct that this study has tried to measure towards confidence in using the Moodle LMS at a rural university in South Africa. It was, therefore, hypothesised that:

H18: Pre-service teachers' confidence in using the Moodle LMS has a positive effect on their continued use of the Moodle LMS

3.3.2.10 Preparedness to Use the Moodle LMS (PPD)

Preparedness (PPD) is the state or condition of being ready, and it emphasises the attitudinal aspect of being ready to do something (Gill & Dalgarno, 2008). In this study, it is predicted that pre-service teachers should be ready or prepared to continue using the Moodle LMS after their acceptance of the resource. In this study, the preparedness to use (PPD) construct is also designed to feed off the actual use (AU) construct and then impact on the continued use (CU) construct.

In an endeavour to understand influences on pre-service teachers' preparedness to use ICTs in the classroom, Gill and Dalgarno (2008) reported a high level of preparedness to use ICTs in the classroom. There was evidence supporting the relationship between the perceived usefulness of ICTs, the perceived ease of use of ICTs, attitudes towards using ICTs, and that these constructs relate to expressed preparedness to use ICTs for learning and teaching (Gill & Dalgarno, 2008). In a separate study to determine the influence of preparedness on online students' feelings

of anxiety, Abdous (2019) reported that students expressed a high level of preparedness to take online courses. In the study by Chitanana et al. (2008), 47% of the users expressed some doubt on their level of preparedness to use the e-learning platforms available at their universities.

The literature bears evidence that pre-service teachers' preparedness to use the Moodle LMS is good for the improvement of their performance and that it stems from their liking of the actual use of the resource. In this study, it was hypothesised that:

H19: Pre-service teachers' preparedness to use the Moodle LMS has a positive effect on their continued use of the MLMS.

3.3.2.11 Continued Use of the Moodle LMS (CU)

The continued use (CU) construct was specifically included in this study in order to explore further pre-service teachers' continued use of the MLMS after its acceptance. In researching about pre-service teachers' acceptance, confidence, preparedness, and continued use of the Moodle LMS, it is envisaged that pre-service teachers are not going to accept the technology just for its sake but because there is need for it, and, hence, the inclusion of the continued use construct. In the literature, the efforts to explain this construct were evident.

In an attempt to identify the social motivations that underlie learners' attitudes and usage behaviour of ICT interactive tools, Hernandez et al. (2011) discovered that 46.7% of continuance intentions were explained by the factors identified in the model. They concluded that continuance intentions were inherent if the conditions for its use permitted it.

In another study, Wu and Zhang (2014) investigated continuance intentions towards e-Learning 2.0 in organisational contexts after they observed that e-Learning 2.0 plays a significant role in training and development within organisational environments after an initial acceptance but its use is frequently discontinued. They concluded that continuance intentions were present, as shown in their results that 52% of continuance intention was explained by the factors identified in their model.

In a conceptual paper by Al Amoush and Sandhu (2018), continued use was included as the focal construct after acceptance of the LMS and they recommended that further research should be done to justify its inclusion in the model (see section 2.10, Figure

2.7). In this study, the researcher intended to identify and explain the factors that affect pre-service teachers' acceptance and continued use of the MLMS.

3.4 Chapter Summary

The theoretical framework that underpins this study was presented in this chapter. The main technology acceptance theories/models used to examine the adoption and acceptance of information communication technologies were discussed. The theories were the theory of reasoned action (TRA) by Fishbein and Ajzen (1975), the theory of planned behaviour (TPB) by (Ajzen & Fishbein, 1980), and the technology acceptance model (TAM) by Davis et al. (1989). The various extensions of the TAM, which gave rise to the modified TAM used in this study, were also discussed. Lastly, SARUTAM, the conceptual framework of this study and its related hypotheses were presented and discussed.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

The purpose of this study study was to examine pre-service teachers' acceptance and continued use of the Moodle learning management system in the context of a South African rural university. This chapter chronicles the research paradigm, research design, population, sampling approach, instrument used, data collection, and data analysis procedures used in this research. The questionnaire instrument was specifically designed and developed for the evaluation of the SARUTAM model, as discussed in section 3.3.2 of Chapter Three.

4.2 Research Paradigm

To unpack and understand the factors that affect pre-service teachers' acceptance and continued use of the MLMS, the researcher used the positivist approach. Positivists hold a deterministic viewpoint which postulates that causes determine effects. They seek to identify factors that affect/cause certain outcomes in any phenomena, using scientific methods to generate new knowledge (Creswell & Creswell, 2017). In the current study, the researcher intends to determine the factors that affect pre-service teachers' acceptance and continued use of the MLMS.

A quantitative approach was used to determine some envisioned truth underlying the acceptance and continued use of the MLMS. This was done using the extended technology acceptance model (TAM). The external factors pertinent to the study were identified and combined with the TAM to form the South African rural universities technology acceptance model (SARUTAM). With the assistance of SmartPLS software, the SARUTAM model was examined using structural equation modelling so as to understand the factors that affect pre-service teachers' acceptance and continued use of the MLMS.

To understand fully the choice of the positivist approach, the philosophical positions of this study are explained herein. These include the ontological, epistemological, logical, axiological, and methodological positions.

4.2.1 Ontological Position

The ultimate goal of doing research is to generate new knowledge, and the researcher's main concern should be about proving the existence of this knowledge. The existence of knowledge, or simply what constitutes knowledge, is therefore the central story of ontology (Creswell, 2013). The ontological position of this study is, therefore, to seek answers to such questions as what is the nature of the real factors affecting pre-service teachers' acceptance and continued use of the MLMS? Do the said factors exist or not? If they exist, how far do they predict the phenomena under study? This culminates into what object should be studied, what the object looks like, what units make it up and how these units interact with one another (Creswell, 2013).

Using the positivist paradigm, the researcher believes that the truth underlying the acceptance and continued use of the MLMS pre-service teachers can be found, and that social phenomena and their meanings have an existence that can be explained by associated social actors.

The researcher believes that human behaviours are triggered by actions that precede their behaviour. In the context of this study, this means that all reality concerning the acceptance of the MLMS by PSTs is already in existence and pre-determined. All that is required is to identify this reality (factors affecting pre-service teachers' acceptance and continued use of the MLMS). This means that the truth underlying the acceptance and continued use of the MLMS pre-service teachers can be found.

The deterministic nature of positivism means that actions are caused by preceding circumstances. Therefore, understanding these casual links is necessary for prediction using the SARUTAM model. Understanding factors that affect PSTs' acceptance of the MLMS becomes imperative. This helps to predict acceptance of the MLMS by PSTs at a rural university in South Africa.

4.2.2 Epistemological Position

A standard scientific approach is required in generating new knowledge about the factors that affect PSTs' acceptance of the MLMS. This refers to the epistemological position of the study. Epistemology is what counts as knowledge and how people get to know what they know (Creswell, 2013). The position held by positivists is that knowledge exists and there are identifiable factors that influence its existence.

Likewise, this study postulates that the factors that affect PSTs' acceptance of the MLMS do exist and they are identifiable.

Furthermore, the researcher believes that this knowledge can be measured objectively using hypothesise and/or knowledge generated deductively from the technology acceptance model, though the knowledge is not constant all the time and in all contexts (Mutambara & Bayaga, 2021). The differences that exist in time and in contexts explain why there are so much varied external factors to the TAM, which in turn explains why the researcher opted to use the extended TAM to analyse these varied factors.

4.2.3 Logical Position

One of the tenets of scientific research is the authenticity of the results which is attained through intellectual rigor. According to McGregor and Murnane (2010), intellectual rigor refers to whether the results are legitimate, believable, valid and/or trustworthy. The legitimacy and validity of results and conclusions is arrived at by looking at the methods used during data collection, data analysis, and interpretation of the results. Validity and reliability are identifiable with the positivist paradigm in achieving intellectual rigor.

The logical position of this study lies in the positivist domain since the instrument used for collecting data for the analysis of the factors affecting PSTs' acceptance of the MLMS was a questionnaire. Statistical tests were carried out on the items/indicators of the constructs chosen for the study to ascertain reliability and validity. For this study, these measures were found to be in good standing (see section 4.9).

4.2.4 Axiological Position

Axiology engages in the assessment of the role played by the researcher throughout the research process. It is the study of what counts as fundamental values (ethics, normative judgements, and moral choices) and the researcher's consciousness in the research process. Axiology sets to explain the roles played by the researcher and the participants in the entire research process (Mack, 2010), thereby concentrating on what the researcher values in the study. This is important because the researcher's values influence how the study is conducted and what the researcher values in the study's findings. Positivists claim neutrality in the research process, thereby believing

that research must be undertaken in a value free-way, and that the researcher is independent of, or objective to, the data (Creswell, 2013).

Keeping in mind that the researcher's values play a significant role in the interpretation of the study's results, the current researcher attempted to be as objective as possible because the research is conducted in a community of people with similar beliefs, attitudes, and values, who are influenced by the same values and norms as the researcher. The researcher is a lecturer at the research site, conducting research on some of the PSTs that he teaches. Therefore, extreme care was taken not to contaminate the research subjects. Otherwise, the values could affect what we see, what we choose to investigate and how the findings are interpreted (Johnson & Onwuegbuzie, 2004). Objectivity in this study was ensured by the choice of an appropriate research design, where a quantitative approach was used.

4.2.5 Methodological Position

The methodological position of this study was informed and guided by the ontological, epistemological, logical, and axiological positions of the research. In trying to understand the factors that affect PSTs' acceptance of the MLMS, a survey was designed to collect quantitative data, which was analysed using structural equation modelling, with the help of the SmartPLS version 3.0 software.

4.3 Research Design

A research design, according to Bertram and Christiansen (2014), is essentially a plan of how the researcher systematically collects and analyses data that is needed to answer the research questions. The aim of this study was to examine the factors that affect PSTs' acceptance and continued use of the MLMS, using a cohort sampled from a population of PSTs of a rural South African university in the province of KwaZulu-Natal, South Africa. The study followed a quantitative research design.

Quantitative research was defined by Armour and Macdonald (2012) as gathering data by unbiassed methods to provide information about relations, comparisons and predictions, without it being contaminated by the researcher. Saunders et al. (2012) further asserted that quantitative research is usually associated with the viewpoint of positivism and deductive research.

This study used the quantitative design in which questionnaires were used to collect quantitative data through a cross-sectional survey. According to Creswell (2003), a cross-sectional survey gathers a large amount of quantitative data at a specified point in time. Thus, the cross-sectional survey was considered the most effective for this quantitative study, since a large amount of data (see section 4.5) was needed from this cohort of PSTs.

Quantitative data analysis methods were applied to analyse the survey data, discover factors that influence pre-service teachers' acceptance and continued use of the MLMS and relationships between the factors, and to investigate the role played by demographic data in pre-service teachers' acceptance of the MLMS. This helped to develop and validate a conceptual model (the SARUTAM) envisaged for the implementation of the MLMSs in rural universities.

4.4 Population

The population of a study, according to Creswell and Creswell (2017), refers to a group of items or individuals who have common characteristics that are of interest to a researcher. A research population, therefore, refers to the entire cluster of people, events, or things of interest that a researcher wishes to explore (Sekaran, 2003). In this study, the researcher focussed on pre-service teachers (PST) enrolled in the Faculty of Education at UNIZULU, a rural based university in South Africa. Other faculties and departments at the institution were not considered because they do not enrol pre-service teachers. Therefore, the population for this study comprised of all the students enrolled in the seven departments of the Faculty of Education at UNIZULU.

Enrolment into the undergraduate programme of this faculty is organised in such a way that some students are in the Foundation Phase (FP), others in the Intermediate and Senior Phase (ISP), while others are in the Further Education Phase (FET). The FP and ISP phase students are taught in the faculty, while the ones in the FET phase are taught from other faculties of UNIZULU.

Annually, the faculty enrols 800 Level 1 undergraduate PSTs (inclusive of the FET phase students), and no more than 500 postgraduate certificate in education (PGCE) students. This suggests that there are also about 800 PSTs in each of Level 2, Level 3, and Level 4 streams, respectively. However, some of these students leave their

studies for one reason or another, while others repeat levels due to underperformance. The number of registered PSTs in the cohort under study is shown in Table 4.1, a total of 3 250.

Table 4.6: Population and sample size

Level	Population size	Sample size (with equal allocation)
Level 1	800	65
Level 2	748	65
Level 3	697	65
Level 4	584	65
PGCE	421	65
Total	3250	325

Since the population was large, it would be time consuming and expensive (Kumar, 2018) to gather data from each and every PST in this cohort. Hence, sampling was required. According to Conroy (2015), a representative sample is one that is at least 10% of the population, as shown in Table 4.6.

4.5 Sampling and Sample Size

Stratified random sampling with equal allocation was used to select participants for this study. The equal allocation technique was chosen because the goal was to have all PSTs represented in the survey irrespective of their proportion in the population. Hence, PSTs' levels of study were used as the strata. Level 1 represented the first stratum of PSTs who are in their first year of study; Levels 2, 3 and 4 represented those who were in their second, third, and fourth years of study respectively. PGCE represented the stratum of postgraduate certificate in education pre-service teachers.

Using the seven-step procedure suggested by (Kumar, 2018), the sample size was calculated to be 325 respondents, divided into five strata of 65 respondents each (Table 4.6). This kind of stratification and sampling ensured that the desired elements of the population were represented in the final sample at all levels, irrespective of the size of the stratum.

After dividing the population into five strata simple random sampling was used to select respondents from each strata using their class lists. This was done to ensure that every PST in each strata had an equal chance of being selected, following recommendations from other researchers (Kumar, 2018; Mills & Gay, 2016; Sharma, 2017). Using their respective numbered class lists, random numbers were used to select the 65 PSTs who made it into the final sample of each strata. Two research assistants were trained and assigned to assist in distributing and collecting the questionnaires from the chosen participants.

This sampling process is in tandem with the requirements of the PLS-SEM recommendations made by Hair et al. (2010), that the minimum sample size required for structural equation modelling (multiple regression and confirmatory factor analysis) should be in the ratio of 20 responses for each independent variable. The study has ten independent variables: pre-service teachers' subjective norm (SN); computer self-efficacy (CSE); perceived resources (PR); perceived ease of use (PEOU) of the MLMS; perceived usefulness (PU) of the MLMS; attitude towards use (ATT); behavioural intention to use (BI) the MLMS; and actual use (AU) of the MLMS; confidence (CON) in using the MLMS; and preparedness (PPD) to use the MLMS. These ten variables would require a minimum sample of 200. The selected sample of 325 was, therefore, more than adequate.

Another recommendation by researchers in selecting a sample size is that a sample must be 10 times the number of indicators of the construct with the most indicators (Bryman, 2016; Hair et al., 2019; Mutambara & Bayaga, 2020b). For this study, the constructs confidence (CON) in using the MLMS and preparedness (PPD) to use the MLMS have the most indicators (nine each). Accordingly, the recommended minimum sample size would be 90 (9 x 10). By this measure, the selected sample size of 325 more than exceeds the recommended 90. This means the sample adequately represented the population under study.

4.6 Data Collection

Data for this study were collected from PSTs in the Faculty of Education of a rural South African university in the province of KwaZulu-Natal. This was done through the

use of a five-point Likert scale questionnaire (see appendix 1), which was administered to the participants within a period of eight weeks.

Questionnaires are considered one of the best instruments used for collecting data. They are the most suitable instruments for collecting quantitative data when the number of respondents is large (Mutambara & Bayaga, 2020b; Onwuegbuzie & Combs, 2010). For the chosen design and the big number of participants in this study, the questionnaire survey was deemed the most suitable method of collecting the quantitative data required in examining the factors that affect pre-service teachers' acceptance and continued use of the MLMS.

4.7 Questionnaire Design

The questionnaire was designed to collect data on the factors that affect pre-service teachers' acceptance and continued use of the MLMS, as well as their confidence and preparedness to use the LMS. According to Saunders et al. (2009), the design of the questionnaire can affect response rate, reliability, and validity of collected data. Hence, this stage was critical to the data collection process. In designing a questionnaire, Foddy and Foddy (1994) concurred that it should have questions that are understood by the respondent in the way that the researcher wants them to, and also for the respondent's answers to be understood by the researcher in the manner that the respondent wants. There are three basic stages that were followed in designing the questionnaire for this study.

The first stage was to select questions or items to be included in the questionnaire. Saunders et al. (2012) outlined three approaches that can be followed when designing a questionnaire. These are: (1) adapting questions from previous related studies, (2) adopting questions used in prior studies, and (3) developing own questions. For this study, most of the questions were adapted from various studies (see appendix 2) and then modified to suit pre-service teachers' acceptance of MLMS and the rural setting of the study. This was in line with the assessment by Saunders et al. (2012) that adapting questions used in other studies is more efficient. A pilot on the new questionnaire was done to validate the new instrument (see section 4.9).

The second stage was to select an appropriate question type. Several caveats were considered in choosing the appropriate questions for this study. For instance, due to

the rural setting of the study, the use of complicated language was avoided; questions that encourage the respondent to respond in a particular way were also avoided; and double-barrelled questions (questions that ask for more than one response) were also avoided. In technology acceptance research, the direct question type to measure users' acceptance of technology is a Likert-scale (Damnjanovic et al., 2015; Gonzales, 2018; Šumak et al., 2011). This study used a five-point Likert scale ranging from 1 - strongly agree to 5 - strongly disagree (see appendix 1). The questions were typed in an agreement statement where respondents (PST) had to select whether they agree or disagree with the statement using the five-point scale.

The third stage crucial to the designing of the questionnaire is its layout. Morrison et al. (2010) espoused that the general layout of the questionnaire, clear instructions and question order are very important aspects when designing a questionnaire. In this study, clear instructions were written to reduce misinterpretation errors, and consequently reduce non-response rate. The simple layout of the questionnaire enabled the PSTs to read and answer questions easily.

Dillman (2008) stated that there is a positive relationship between a good cover page and the response rate of a survey. Consequently, the researcher of the current study developed a questionnaire cover page that clearly explained and clarified the purpose of the study; the approximate time needed to respond to the questionnaire; the voluntary participation; and the confidentiality features of the survey.

The design of the questionnaire fitted into three distinct sections. The first section gave a brief description, the objectives and importance of the study. The approximate time needed to complete the questionnaire was also given. The second section (Section A) intended to capture demographic data of PSTs. The third and last section (Section B) comprised of questions to collect data on the various constructs affecting pre-service teachers' acceptance and, hence, continued use of the MLMS including their confidence and preparedness to use the LMS. Most of the items/indicators were adapted from previous research studies (Binyamin et al., 2018; Cheng et al., 2006; Clare et al., 2019; Gonzales, 2018; Jahangir & Begum, 2008; Lee et al., 2003; Rabaa'i, 2016; Roca & Gagné, 2008; Samos et al., 2019; Sánchez-Prieto et al., 2019; Sivo et al., 2018). They were then modified to suit the current study (as seen in Appendix 2) where the constructs, measurement indicators, and sources were given.

The questionnaire was carefully constructed and written in simple language so that all respondents would understand. Simple and clear instructions were also written on the questionnaire on how to respond to every question. The purpose of the study was clearly written on the cover page of the questionnaire. The contact details of the researcher were also written on the cover page of the questionnaire in case respondents needed some further clarifications. The high response rate to the survey was testimony that the questionnaire items were clear to the respondents.

4.8 The Pilot Study

To validate the instrument developed for collecting data for the current research, a pilot study was conducted. The pilot aimed to test the data collection instrument; to understand the feasibility of participant recruitment; and to test the validity and reliability of the instrument using basic statistics from SPSS. This is what Arain et al. (2010) and Lowe (2019) referred to as a small feasibility study designed to test various aspects of the methods planned for a larger, more rigorous, or confirmatory investigation (Arain et al., 2010; Lowe, 2019).

A total of 200 respondents were selected for the pilot study from the FET phase PSTs at the research site from which 113 valid responses were collected. This was done in line with recommendations from other researchers (In, 2017; Whitehead et al., 2016), that a good sample size for a pilot study is mandatory and as a general rule of thumb researchers need to use at least 30 subjects or more to fairly estimate the parameter under study. The FET phase group of respondents used in this pilot study was *ring-fenced* so that they do not participate again in the main study for fear of contaminating the sample of the main study (Whitehead et al., 2016). The pilot data collection process was conducted in a period of four weeks, after which analysis was done using basic statistics generated using the SPSS programme.

The Cronbach's alpha index was used to measure the reliability of the items/indicators used to gather data. According to Pallant (2020), a Cronbach's alpha index of 0.6 to 0.7 indicates an acceptable level of reliability, while 0.8 or greater is best. Alternatively, the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) and the Bartlett's test of sphericity were used to measure validity of the instrument. For the validity test, a

minimum KMO index of 0.5 is acceptable, while the Bartlett's test of sphericity probability of less than 0.05 is good (Dziuban & Shirkey, 1974; Pallant, 2020).

Reliability and validity indexes for each of the 11 constructs of this pilot study were calculated and the results are shown in Table 4.2. All the indexes for the constructs were approximately 0.7 or greater while the KMOs were all greater than 0.5, while the significance levels (measured by the Bartlett's test of sphericity) were all less than 0.05. The overall Cronbach's alpha index of the pilot data set was 0.975, while the overall validity of the instrument was 0.753. These figures confirmed that the items/indicators identified for the study were reliable and that the instrument was valid.

Table 4.7: Constructs' reliability and validity test results

Construct	Code	Cronbach's index	KMO	Sig.
Perceived confidence in using Moodle	CON	0.870	0.793	0.000
Perceived preparedness to use Moodle	PPD	0.828	0.809	0.000
Perceived usefulness of Moodle	PU	0.772	0.732	0.000
Perceived ease of use of Moodle	PEOU	0.714	0.734	0.000
Access to Moodle resources	PR	0.799	0.722	0.000
Intention to use of Moodle	BI	0.795	0.760	0.000
Actual use of Moodle	AU	0.694	0.744	0.000
Continued use of Moodle	CU	0.670	0.625	0.000
Computer self-efficacy	CSE	0.787	0.758	0.000
Subjective norm	SN	0.799	0.722	0.000
Perceived attitude	ATT	0.795	0.760	0.000
Overall model		0.975	0.753	

Besides the statistical reliability and validity to validate the instrument, the researcher sought validation of the instrument from experts in the field. Expert validation, in the context of this thesis, refers to the process (by experts in the field) of determining that the research instrument actually satisfies the purpose for which it was intended (Taherdoost, 2016). Two professors from the faculty agreed to critique the instrument.

Their comments were considered and necessary adjustments were made to the instrument.

The following changes were made:

- The structure of the questionnaire was adjusted to improve its appeal to respondents, following recommendations by the consulted experts.
- Some technical terms such as Turnitin, forum, URL, etc. were removed so that the items did not become a barrier to the respondents' understanding of the questions.
- The construct access to resources for the use of Moodle was changed to perceived resources for the use of Moodle.
- The construct intention to use Moodle was adjusted to behavioural intention to use Moodle, in line with the language of the TAM theoretical framework.
- One more item/indicator was added to the behavioural intention to use Moodle construct to make them four.
- Construct codes were added to the questionnaire, e.g. CON, PPD, PU, and PEOU,
- The codes were also assigned numbers for easy of reference by respondents, for example, CON1, CON2, PU1, and PU2, etc.
- The indicators CON10, CON11, PPD10, and PPD11 proved to be redundant and, hence, were removed from the questionnaire.

Following the successful results of the pilot study and expert validation of the instrument, it was now ready for collection of data for the main study as reiterated by Saunders et al. (2012) that, after the questionnaire has been pilot tested, the necessary changes made to the questionnaire, and the study sample has been selected, the next step is to gain access to the main study sample, with the aim of distributing the instrument. The process of collecting data for the main study has been further outlined.

4.9 Data Collection Procedure

On completion of the pilot study, corrections to the instrument were affected, after which the instrument was ready for distribution to the respondents of the main study. This subsection chronicles how the researcher administered the survey.

The following ethical procedures were strictly observed:

- The respondents were informed of the purpose of the study.
- The respondents were informed that participation in the study was voluntary and that they could withdraw at any time if they feel like doing so.
- The respondents were informed and encouraged to remain anonymous.
- An informed consent letter accompanied each questionnaire.

The researcher explained the structure of the instrument to respondents after which they were asked to collect and return the instrument at their earliest convenience. Respondents were encouraged to think carefully about their responses to the questions. Respondents were constantly reminded of returning the completed questionnaires throughout the stipulated period. Some respondents were able to return the completed questionnaires within days and the coding and recording processes started at once.

The data collection exercise did not run entirely smoothly though. Some questionnaires were returned blank, while others were incomplete. Some were not returned at all, although they were in the minority.

4.10 Data Analysis Procedure

The study aimed to examine the factors that affect pre-service teachers' acceptance and continued use of the Moodle learning management system in the context of a rural South African university. It followed a quantitative design which made use of structural equation modeling (SEM) in analysing the data. The following sections were designed to explain fully the structure of this methodology.

4.10.1 Structural Equation Modeling

Structural equation modelling (SEM) is a group of statistical models that are used to test theoretical models involving proposed causal associations among a set of

variables (Schumacker & Lomax, 2016). SEM uses various types of models to depict relationships among observed variables, with the same basic goal of providing a quantitative test of a theoretical model hypothesised by the researcher (Schumacker & Lomax, 2016). SEM is also defined as a multivariate technique merging aspects of factor analysis and multiple regression that allows the researcher to concurrently scrutinise a series of interrelated dependent relationships among the measured variables and latent constructs, as well as between several latent constructs (Hair et al., 2014; Hair Jr et al., 2014; Mutambara & Bayaga, 2021). SEM offers better advantages when applied correctly over the first generation of analysis techniques (factor analysis or multiple regression) because it allows the researcher to the interplay between data and theory (Hair Jr et al., 2018).

According to Mutambara and Bayaga (2021), SEM allows the researcher to 1) model errors in measurement for observed variables; 2) construct unobservable/latent variables; 3) model relationships among multiple independent variables and dependent variables; and 4) statistically test *a priori* theory and measure assumptions against empirical data.

There are two main approaches to estimating the relationships in a structural equation model which are the component-based or variance-based approach, such as partial least squares (PLS-SEM), and a co-variance-based approach (CB-SEM) (Hair et al., 2010; Hair et al., 2014). The underlying statistical assumptions of the two approaches are different, and they also differ in terms of the nature of fit statistics they produce (Gefen et al., 2000; Hair et al., 2014). Each method suits a different study viewpoint, and investigators need to grasp the differences to apply the correct method (Hair et al., 2017). According to Hair et al. (2017), PLS-SEM is exploratory while CB-SEM is confirmatory. This means that PLS-SEM is utilised to develop theory in exploratory research while CB-SEM is mainly used to confirm or reject theories. The advantages of CB-SEM are the disadvantages of PLS-SEM, and vice versa. Thus, the two are considered different but complementary statistical methods for SEM (Hair et al., 2014).

In application, the CB-SEM uses the maximum likelihood function to minimise the difference between the sample covariance and those predicted by the theoretical model (Hair et al., 2017). The estimated parameters attempt to reproduce the observed values' covariance matrix (Hair et al., 2017). The maximum likelihood function requires data to be normally distributed and the observations should be

independent of one another (Chin, 1998; Hair et al., 2012). In contrast, PLS-SEM maximises the covariance between the independent unobservable variable and the dependent unobservable variable (Sosik et al., 2009).

According to Chin (1998), PLS uses the least squares estimation for single and multi-component models and canonical correlation, which is the biggest characteristic that makes the method stand out.

4.10.2 Rules of Thumb for Selecting CB-SEM or PLS-SEM

Researchers need to understand the assumptions underlying the CB-SEM and PLS-SEM to determine which statistical method is appropriate to use (Hair et al., 2012). The selection between these two SEM statistical methods can be made based on five considerations: (1) research objective, (2) data characteristics, (3) type of measurement model specification, (4) modelling of the structural model, and (5) model evaluation (Hair et al., 2012; Hair Jr et al., 2014). The following rules can be used to guide researchers in choosing between PLS-SEM and CB-SEM.

Firstly, the objective of the research should guide the researcher when selecting between PLS-SEM and CB-SEM. PLS-SEM is the appropriate method to use in situations where the theory is less developed and the objective focuses on prediction and explaining the variance of key target constructs (Hair et al., 2014; Hair et al., 2012). PLS-SEM uses available data to "estimate the path relationships in the model to minimise the error terms of the endogenous constructs" (Hair et al., 2012, p. 14).

The path model relationships in PLS-SEM maximise the R^2 values (coefficient of determination) of the (target) dependent variables. Thus, PLS-SEM is the preferred SEM method when the objective of the research focuses on theory development and explanation of variance.

In contrast, CB-SEM is a preferred method when the research objective is to test or confirm a theory. This is based on the suggestion by Barclay et al. (1995) that the ability to show how well a theoretical model fits the observed data is very important when testing theory.

Secondly, PLS-SEM can be used to analyse a research model that is made up of both formative and reflective constructs (Chin, 1998). PLS-SEM gives researchers the flexibility of using either formative or reflective or a combination of both formative and

reflective constructs in the same model (Hair et al., 2017). Additionally, PLS-SEM can easily handle single-item constructs, with no identification problems. Unlike CB-SEM, the PLS-SEM can handle with ease complicated models with many constructs and many observable variables (Hair et al., 2017). In contrast, in CB-SEM, researchers are restricted to reflective constructs only (Hair et al., 2017). Henseler et al. (2009) found that the use of formative constructs with CB-SEM leads to identification problems.

Thirdly, PLS-SEM uses calibration mechanisms that change any data which are not normally distributed into data that follow the central limit theorem, and, as a result, data normality is not a demand, while CB-SEM requires a set of assumptions to be fulfilled before further analysis can be done (Beebe & Seasholtz, 1998; Hair et al., 2012). The CB-SEM assumptions that needed to be met were: (1) data multivariate normality, (2) observation independence and (3) variable metric uniformity (Hair et al., 2014; Sosik et al., 2009). Unlike CB-SEM, PLS-SEM can also be used in situations where the sample size is relatively small, such as 10 times the number of items of the construct with the most items in the model.

4.10.3 Justification for Using PLS-SEM

PLS-SEM is the appropriate method to use in situations where the theory is less developed, the aim focuses on prediction and the variance of the main endogenous variable needs explaining (Hair et al., 2012). PLS-SEM was appropriate for the current study since it seeks to predict and explain the factors that affect pre-service teachers' acceptance and continued use of the Moodle learning management system (MLMS) in the context of a rural South Africa university. The study further sought to extend the TAM by developing and evaluating a new model (the SARUTAM) that can be used to predict pre-service teachers' acceptance and continued use of the MLMS.

PLS-SEM works efficiently with small sample sizes such as 10 times bigger than the number of indicators of the construct with most indicators, complex models and it needs no assumptions about data distributions and data normality (Hair Jr et al., 2014; Henseler et al., 2009). The sample size for this study was 300, with 10 variables, all trying to estimate the explained variable (continued use of the MLMS). Additionally, the proposed SARUTAM model has 11 latent variables and 19 hypotheses, which makes it very complex, and hence the use of structural equation modeling. PLS-SEM was used in this case as it deals with complex models better than CB-SEM.

Furthermore, data to be used in this study are not normally distributed and, as a result, PLS-SEM was preferred ahead of CB-SEM.

The focus of the current study was to test the relationships among the constructs based on prior theoretical knowledge. The ability of PLS-SEM to estimate the correlations between the residuals and assess their impacts on the model makes this technique an appropriate approach (Hair et al., 2017). PLS-SEM is very efficient at estimating parameters, which results in high levels of explanatory power (Garson, 2016).

Over the years, several software packages have been developed for the PLS-SEM. These include, but are not limited to, PLS-Graph (Chin, 2001); LVPLS (Lohmoller, 1988); VisualPLS (FU, 2006); PLS-GUI (LI, 2005); and SmartPLS (Sarstedt & Cheah, 2019; Sarstedt et al., 2017).

The SmartPLS 3.0 software was used to execute all the PLS-SEM analyses in this study because it is comprehensive with an exclusive intuitive graphical user interface.

4.11 Evaluating Measurement and Structural Models Using PLS-SEM

The two-step process suggested by Hair et al. (2014) was used in this study to assess the suggested SARUTAM model. First, the measurement (outer) model was assessed to ascertain validity and reliability. Second, the structural (inner) model was assessed to determine the explanatory power of the model. This was done to determine whether the model fulfils the quality criteria for empirical work (Sarstedt & Cheah, 2019).

The subsequent subsections discuss the guidelines used in this study to evaluate both the measurement and the structural models.

4.11.1 Measurement Model

Validation of the measurement model can be achieved by testing its convergent validity, internal consistency, indicator reliability, and discriminant validity (Hair et al., 2017). If these are in the affirmative, then the measurement model is in good standing and can be used for evaluation of the overall model. These aspects are examined in detail.

4.11.1.1 Internal Consistency

Traditionally, Cronbach's alpha (CA) is used to assess the model indicators/items' internal consistency and provides an estimate of the reliability based on the intercorrelations of the observed item variables (Hair et al., 2017). CA assumes that all the items are equally reliable (Hair et al., 2014). However, CA has a weakness that it is sensitive to the number of indicators in the scale and it tends to underestimate the internal consistency reliability. Due to the weakness of CA, composite reliability (CR) is a preferred alternative to Cronbach's alpha (Hair et al., 2014).

Compared to the Cronbach's alpha, composite reliability may lead to higher estimates of true reliability (Garson, 2016). Like CA, the CR ranges from 0 to 1. Higher CR values indicate higher levels of reliability. Interpretation of these two variables is the same where 0.7 is the benchmark, although composite reliability values of 0.6 to 0.7 are acceptable in exploratory research (Chin, 1998; Hair et al., 2014).

4.11.1.2 Indicator Reliability

Indicator reliability is used to evaluate the extent to which a variable or a set of variables is consistent with what it intends to measure (Garson, 2016; Hair et al., 2019). The reliability construct is independent of and calculated separately from other constructs. According to Chin (1998), the loading should be greater than 0.7 and indicator loadings should be significant at least at the 0.05 level. This is because constructs should explain at least 50% of the variance of their respective items (Chin, 1998; Henseler et al., 2009), and it is also the level at which the explained variance is greater than error variance (Garson, 2016). The significance of the indicator loadings can be verified using a resampling method such as bootstrapping or jack-knifing (Hair et al., 2014). Indicators whose loadings are lower than 0.7 are normally removed. However, a researcher should be cautious when deciding to delete an item, taking into consideration PLS characteristics of consistency at large (Henseler et al., 2009).

4.11.1.3 Convergent Validity

Convergent validity is "the extent to which a measure correlates positively with alternative measures of the same construct" (Hair et al., 2014, p 102). The average variance extracted (AVE) and outer loadings of the indicators are used to assess the convergent validity (Hair et al., 2014). An AVE value of at least 0.5 and a factor loading

of at least 0.7 indicate a sufficient convergent validity, such that indicators with outer loadings below 0.4 should be removed from the model (Fornell & Larcker, 1981; Hair et al., 2019). Items with outer loadings between 0.4 and 0.7 are candidates for removal from the model. However, they should be removed only if their removal increases the composite reliability to be above 0.7 or the AVE to be above 0.5 (Hair et al., 2017). Indicators with loadings less than 0.7 may also be retained due to their contribution to content validity (Hair et al., 2019).

4.11.1.4 Discriminant Validity

Discriminant validity is "the extent to which a construct is truly distinct from other constructs by empirical standards" (Hair et al., 2014, p 104). Therefore, establishing discriminant validity indicates that a construct is different from others and it is the only construct in the model capturing that phenomena. The cross-loading, Fornell-Larcker's criterion and Heterotrait-Monotrait Ratio (HTMT) are the three aspects used to assess discriminant validity (Garson, 2016; Hair et al., 2014)

4.11.1.4.1 Cross-Loadings

Cross-loading is obtained by correlating each component score with all of the other indicators (Chin, 1998). Discriminant validity is established if an item loads in its associated construct higher than its loadings with all other constructs. The item's outer loading on the associated latent variable must be bigger than any of its cross-loadings on other latent variables.

4.11.1.4.2 Fornell-Larcker's Criterion

Using Fornell-Larcker's criterion requires the latent variable to share more variance with its assigned indicators than with any other latent variable (Hair et al., 2014). Therefore, the square root of the average variance extracted should be greater than its correlation with any other construct. In SmartPLS 3 output, the Fornell-Larcker criterion table, the square root of AVE appears in the diagonal cells and correlations appear below it (Hair et al., 2014). Therefore, if the number on the top of each factor column is greater than the numbers under it, discriminant validity is attained.

4.11.1.4.3 Heterotrait-Monotrait Ratio (HTMT)

Traditionally the Fornell-Larcker criterion and cross-loadings are accepted methods of assessing the discriminant validity. However, the Fornell-Larcker criterion and cross-loadings have shortcomings, such that the HTMT ratio is the preferred measure of discriminant validity (Henseler et al., 2015). According to Henseler et al. (2015) the HTMT value below 0.90, indicates that discriminant validity has been established. Gold et al. (2001) also use the 0.90 cut-off, though some researchers (Clark & Watson, 1995; Kline, 2011) use the more stringent cut-off of 0.85.

4.11.2 The Structural Model

After validating the measurement model, the next step was the evaluation of the structural (inner) model. Validating the inner model results helps the researcher to determine how well the empirical data support theory. Furthermore, assessing the inner model also helps in deciding whether the theory has been empirically confirmed (Hair et al., 2014). In PLS-SEM, this process involves examining the model's predictive capabilities (R^2) and the relationships between the constructs (path coefficients). The following steps were followed in evaluating the inner model.

4.11.2.1 Multicollinearity

Multicollinearity exists when two or more exogenous variables are highly intercorrelated (Garson, 2016). In PLS-SEM, multicollinearity inflates standard errors and prevents the researcher from assessing the relative importance of one exogenous variable compared to another (Hair et al., 204). According to Garson (2016), the rule of thumb is that the variance inflation factor (VIF) coefficient of less than 4.0 show that there are no problems of multicollinearity. However, researchers like Hair et al. (2014) use a more lenient cut-off of 5.0.

4.11.2.2 Path Coefficients

In this study, the PLS-SEM algorithm was used to determine the structural model relationships (path coefficient) using the SmartPLS version 3.0 software. These path coefficients represent the hypothesised relationships among the latent variables. The standardised values of the path coefficients are between -1 to +1. A standardised path coefficient close to 1 indicates strong positive relationships (and the opposite is true for negative values), that are almost always statistically significant (Hair et al., 2017).

The closer the path coefficient is to 0, the weaker the relationship and is usually not statistically significant. To determine whether a path is significant or not, the bootstrapping method was used. The minimum number of bootstrap subsamples should be 5,000 (Hair et al., 2014).

According to Hair et al. (2014), the commonly used critical values for two-tailed tests are 1.65 (significance level= 10%), 1.96 (significance level = 5%), and 2.57 (significance level = 1%. This study used a significant level of 10% due to its exploratory nature (Hair et al., 2014).

4.11.2.3 Coefficient of Determination (R-Squared Value)

The widely used measure to assess the inner model is the coefficient of determination (R^2 value). The R^2 coefficient is a measure of the model's predictive accuracy, and it represents the exogenous variables' combined effects on the endogenous variable. Coefficient of determination values of 0.19, 0.33 and 0.67 are considered to be “weak”, “moderate” and “substantial”, respectively (Chin, 1998; Höck & Ringle, 2006).

4.11.2.4 Effect Size F-Squared

The R^2 change effect is also known as the f-square effect size. The f-square equation shows the effect of removing an exogenous variable on the R^2 value. In other words, it shows the contribution of the exogenous variable on the R^2 value (Hair et al., 2014). According to (Garson, 2016), the f-square values of 0.02, 0.15 and 0.35 respectively represent a small, medium, and high effect of the exogenous latent variable.

4.11.2.5 Blindfolding and Predictive Relevance Q-Squared

In Smart PLS 3.0, the cross-validated redundancy for a reflective model endogenous factor is the Stone-Gleisser Q- squared value (Garson, 2016; Hair et al., 2014). In this study, the cross-validated redundancy was used to assess predictive relevance (Q-squared). A Q-squared value above 0 indicates that the model is relevant to predicting that factor.

4.12 Moderation

In this study, moderation was used to assess if pre-service teachers’ demographic data had an effect on their continued use of the MLMS at the research site. Moderation

in SmartPLS refers to a situation where the relationship between two variables is not static but dependent on a third variable (moderator), which may change the strength or direction of the relationship between the two model variables under review (Hair Jr et al., 2016). The moderation relationships in this study were hypothesised *a priori*. A moderation relationship is established if the hypothesis between the two variables under consideration is accepted at 5% level of significance with a t-value greater than 1.96 (Memon et al., 2019).

4.13 Ethical Consideration

In order that the research is in compliancy with the university's research ethics, the researcher applied for ethical clearance which was granted through the University of Zululand Research Ethics Committee (UZREC). From the University registrar's office, the researcher also asked for permission to collect data from students, which was granted. This was done so that no one's rights were violated during the data collection process and to make sure that the research is not harmful to all parties involved. All ethical considerations were followed throughout the data collection process.

A consent letter explaining the purpose of the research was given to respondents. It stated that participation was voluntary and outlined the procedures to be used during the research. The rights of respondents to decline to participate and to withdraw their participation at any time they wanted to do so, was also emphasised. It also stipulated that there were no consequences should one chooses to withdraw from participating. The respondents were also made aware of the academic benefits of the research, and the confidentiality of the data collected.

Anonymity was emphasised and any personal information that could be used to identify participants was not included on the questionnaire. Lastly, data collected from respondents were treated with confidentiality and that it would only be used for the current study.

To ensure credibility of results, the researcher made sure that data were collected from willing participants. Two research assistants were trained to assist in this regard. The participants were also encouraged to be honest in their responses to items/indicators on the questionnaire. The researcher also reported the research findings honestly, without suppressing or falsifying data in a bid to meet the needs of the research.

To ensure dependability, the researcher reported the processes within the study in detail. This was done to ensure that the study can be replicated by future researchers, if there is need to do so. To ensure trustworthiness, the researcher maintained the databases so that the research can be audited by interested parties. This was done to enable the reader to independent judgements concerning the qualities of the analysis. Auditability provides for replication and also promotes rigour in both data collection and data analysis (Bisman, 2010). To enable auditability, the documentation was kept confidential and safe following data collection, thus promoting reliability and validity.

4.14 Chapter Summary

An account of the approach and methodology used in this study was given in this chapter. An outline of the research philosophy, being a positivist paradigm was given. Also discussed were the ontological, epistemological, logical, axiology, and methodological positions of the study. The quantitative research design employed in this study was also expounded. The population, sampling procedures, and the sample size of the study were also outlined in this chapter. The method of data collection section addressed the data collection instrument, reliability, and validity of the instrument. Quantitative data analysis technics employed and the ethical considerations in the study were also discussed in this chapter.

CHAPTER FIVE

PRESENTATION AND ANALYSIS OF RESULTS

5.1 Introduction

This chapter focuses on the presentation and an analysis of the results of the study. The data were generated through the use of a five-point Likert scale questionnaire (see Appendix 1). The presentation and analysis are divided into three steps. The first step is data preparation so as to ensure that the collected data is clean, useful, and valid for testing. In this stage, missing data issues, outliers, and normality were assessed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics of the respondents' demographic characteristics were also presented. The second stage focused on the assessment of the measurement model. In this stage, the SmartPLS 3 was used to assess indicator reliability, internal consistency, convergent validity, and discriminant validity. The third stage focused on the evaluation of the structural model. In this stage the results of multicollinearity, R-squared, f-squared, Q-squared, path coefficients, and moderation analyses were presented. Lastly, a summary of the chapter has been presented.

5.2 Data Preparation

Data preparation is the process of coding, editing, assessment of outliers, normality testing, and consolidating data into one file or data table, primarily for use in analysis (Cooper & Schindler, 2008). This process ensures that the process of converting raw data to forms that are suitable for analysis is done accurately. The following sections describe the coding, editing, assessment of outliers, and normality testing.

5.2.1 Coding

Coding can be defined as the process of allocating numbers to the responses of respondents (Cooper & Schindler, 2008). Coding was done to ensure that the responses provided by respondents are grouped into a limited number of defined categories. In this thesis, pre-coding and post-coding was employed in this study. Pre-coding is the process of assigning codes before respondents provide answers on the questionnaire. This was done during the questionnaire design stage. For example,

item one on construct confidence was given CON1. Additionally, all the questions in the questionnaire used a five-point Likert scale with the categories 1 - strongly agree, 2 - agree, 3 – undecided, 4 - disagree, and 5 - strongly disagree. Post-coding is done when the data has already been collected from the respondents. The demographics were post-coded.

5.2.2 Editing

According to Cooper and Schindler (2008), editing is done to ensure that the data are captured correctly, accurately, and consistently. It is also done to make sure that there is no missing data (Cooper & Schindler, 2008). This study followed the suggestion by Cooper and Schindler (2008), that, if the sample size is large, all entries with missing data should be deleted. Missing data occurred when a respondent failed to answer one or more questions in the questionnaire. A total of 14 entries were removed because of missing data where the respondents failed to answer more that 50% of the questions in the questionnaire. According to Hair et al. (2010), if one respondent failed to answer more than 50% of the questionnaires questions, then the data entry should be deleted. Cooper and Schindler (2008) also stated that entries where respondents selected the same answer for all question should be removed. Following the suggestion of Cooper and Schindler (2008), seven more entries were removed. A total of 21 data entries were removed from the data file during this process. The total number of data entries that were stored as the source file were 263.

5.2.3 Assessment of Outliers

An outlier is defined as a value that is well above or below the rest of other cases (Pallant, 2020). To check for outliers, the Malahanobis distance from the Statistical Package for Social Sciences (SPSS) was used. A new variable (mah_1) was created in SPSS and then compared to the critical value. A mah_1 greater than the critical value is considered an outlier (Pallant, 2020). In this study, 11 cases were considered as outliers and were removed from the data (see section 5.3). A data source with 252 data entries was created and saved as a comma-separated values (.csv) file, which is the format used in the SmartPLS 3 software to analyse data.

5.2.4 Normality Test

Normality is defined by Hair et al. (2010) as the degree to which the distribution of the sample data corresponds to a normal distribution. This study used the SPSS's Kolmogorov-Smirnov and Shapiro-Wilks tests to test for normality. The results (see Appendix 4) showed that the data were not following a normal distribution since all the Kolmogorov-Smirnov and Shapiro-Wilks statistics were significant at level 5% level of significance. The test for normality was done as a formality because it is already known that a Likert scale data set does not follow a normal distribution. The fact that Likert scale data does not follow a normal distribution means that SPSS cannot be used to analyse the data for this study. This is one of the reasons why the researcher opted for partial least squares structural equations modeling (PLS-SEM).

5.3 Descriptive Statistics

Descriptive statistics of respondents give insight into the demographic profiles of respondents who participated in the survey (Pallant, 2020). A total of 325 questionnaires (see sections 4.5 and 4.6 in Chapter Four) were handed out to the 325 respondents in the study sample, of which 284 were collected successfully, giving a response rate of 87.4%. There were 21 spoiled questionnaires, 11 outliers (see section 5.2.3), and 41 defaulters. The spoiled questionnaires and the outliers were removed from the sample during the data screening process. Valid responses used in this study were 252, giving a success rate of 77.5%.

5.3.1 Gender

Out of 252 pre-service teachers who took part in this study, there were less male respondents 109 (43.3%), than female respondents 143 (56.7%). Table 5.1 shows the gender distribution of the respondents where the sample size was n = 252.

Table 5.8: Gender distribution (N =252)

Gender	Frequency	Percent	Cumulative percent
Male	109	43.3	43.3
Female	143	56.7	100
Total	252	100	

5.3.2 Age

The ages of the respondents of this study are tabulated in Table 5.2 The results showed that there were 2 (0.8%) respondents who were 18 years and below who took part in this study. Of the 252 respondents, 36 (14.3%) were 19 - 20 years of age; 72 (28.6%) were 21 - 22 years of age; 83 (32.9%) were 23 - 24 years of age, and 59 (23.4%) were 25 years and above.

Table 5.9: Age of respondents (N=252)

Age	Frequency	Percent	Cumulative percent
18 years and below	2	0.8	0.8
19-20 years	36	14.3	15.1
21-22 years	72	28.6	43.7
23-24 years	83	32.9	76.6
25 years and above	59	23.4	100
Total	252	100	

5.3.3 Level of Study

The level of study of the respondents is shown in Table 5.3, where the results were that 43 respondents (17.1%) were in first year; 50 (19,8%) were in their second year; 52 (20.6%) were in their third year; 61 (24.2%) were in their final year, and 46 (18.3%) were studying a postgraduate certificate in education.

Table 5.10: Level of study (N =252)

Level	Frequency	Percent	Cumulative percent
Level 1	43	17.1	17.1
Level 2	50	19.8	36.9
Level 3	52	20.6	57.5
Level 4	61	24.2	81.7
PGCE	46	18.3	100
Total	252	100	

5.4 Descriptive Statistics of the Instrument

All the constructs of the model in this study were measured using a five-point Likert scale, with categories 1 - strongly agree, 2 - agree, 3 - undecided, 4 - disagree, and 5 - strongly disagree. A lower indicator mean (less than 3) implies that the respondents agree with the indicator of the construct it represents. A higher indicator mean (greater than 3) implies that most of the respondents disagreed with the indicator on the questionnaire for that particular construct.

5.4.1 Confidence

In this study, the confidence construct measured pre-service teachers' confidence in using the Moodle LMS. The results presented in Table 5.4 show the confidence of pre-service teachers to use Moodle. The range of the mean values were from 1.86 to 2.50, indicating that the majority of pre-service teachers were confident in using the Moodle LMS, since the mean of each indicator was less than 3.

Table 5.11: Confidence (N = 252)

Confidence	N	Mean	Std Deviation
I am confident when using Moodle in class.	252	1.86	1.050
I am confident when using Moodle tools for educational purposes.	252	2.01	1.02
I am confident when using Moodle as an educational tool.	252	2.34	1.189
I am confident when accessing a course on Moodle.	252	2.25	1.128
I am confident in using the messaging tool on Moodle.	252	2.25	1.100
I am confident when uploading files for assessment on Moodle.	252	2.42	1.203
I am confident when downloading files from Moodle.	252	2.12	1.099
I am confident when using the chat tool in Moodle.	252	2.50	1.183
I am confident when using the forum tool on Moodle.	252	2.08	1.079

5.4.2 Preparedness

In this study, the preparedness construct measures pre-service teachers' readiness to use the Moodle LMS. The results in Table 5.5 show that mean values of all the questions of this construct (preparedness) were less than 3, indicating that the majority of the respondents did agree with the indicators. This implies that pre-service teachers who participated in this study were prepared to use Moodle.

Table 5.12: Preparedness (N = 252)

Preparedness	N	Mean	Std Deviation
I can login to Moodle without assistance.	252	2.42	1.262
I am able to navigate through Moodle tools without assistance.	252	2.31	1.059
I can update my Moodle profile settings without assistance.	252	2.52	1.122
I am able to download my course grades from Moodle.	252	2.62	1.213
I am able to upload files for marking on Moodle.	252	2.55	1.119
I am able to participate in discussions on Moodle forums.	252	2.42	1.089
I am able to access feedback from lecturers on Moodle.	252	2.48	1.148
I am able to respond to quizzes on Moodle.	252	2.30	1.054
I am able to download materials from folders on Moodle.	252	2.45	1.147

5.4.3 Perceived Usefulness

Perceived usefulness is pre-service teachers' belief that using Moodle will improve their performance in their studies. The results in Table 5.6 show that all the questions had mean values of less than 3. These results indicate that pre-service teachers agreed that using Moodle would improve their academic performance.

Table 5.13: Perceived usefulness (N = 252)

Perceived usefulness	N	Mean	Std Deviation
I find Moodle useful for learning.	252	2.43	1.132
Using Moodle makes my learning more effective.	252	2.59	1.145
Using Moodle helps me to improve my learning performance.	252	2.52	1.196
Using Moodle enables me to accomplish tasks more quickly.	252	2.89	1.159
Using Moodle enables me to score better grades in my coursework.	252	2.67	1.311

5.4.4 Perceived Ease of Use

The descriptive statistics for the construct perceived ease of use are shown in Table 5.7. The results showed that the mean ranged from 2.05 to 2.46. Perceived ease of use is the degree to which users believe that using new information system will be free of effort. The mean values for all the construct's items were less than 3, indicating that, generally, the respondents of this study agreed that they found using Moodle for their studies to be free of effort.

Table 5.14: Perceived ease of use (N = 252)

Perceived ease of use	N	Mean	Std Deviation
Learning to use Moodle was easy for me.	252	2.46	1.137
I found Moodle easy to use.	252	2.38	1.153
It was easy to become skilful at using Moodle.	252	2.44	1.126
My interaction with Moodle is clear and understandable.	252	2.32	1.084
I find it easy to navigate through most of the Moodle tools.	252	2.05	1.205

5.4.5 Perceived Resources

Perceived resources is the degree to which an individual believes that an organisational and technical infrastructure exists to support the use of the information system. In this study, the resources needed were the learning management system

(Moodle), devices (laptop or smartphone), and internet connection. The results in Table 5.8 show that all the mean values of this construct were less than 3. The results were that pre-service teachers agreed that they have the resources that they need to use Moodle.

Table 5.15: Perceived resources (N = 252)

Perceived resources	N	Mean	Std Deviation
I have the resources I need to use Moodle.	252	2.27	1.184
I have access to the resources I need to use Moodle.	252	2.46	1.291
I am able to use Moodle any time I want.	252	2.4	1.154
There are no barriers to my using Moodle in computer labs.	252	2.24	1.119
I have Moodle installed on my laptop and smartphone.	252	2.46	1.177

5.4.6 Behavioural Intention

Behavioural intention is defined as the strength of users' intention to use any information system. The descriptive statistics results are shown in Table 5.9. The range of the mean values of behavioural intention were from 2.13 to 2.50. The mean values were all below 3, indicating that pre-service teachers have the intention to use Moodle for learning.

Table 5.16: Behavioural intention (N = 252)

Behavioural intention	N	Mean	Std Deviation
I intend to increase my use of Moodle in different learning activities	252	2.13	1.089
I see myself using Moodle for handling my university related work	252	2.50	1.145
I intend to use Moodle for my future studies	252	2.15	1.125
I would recommend using Moodle to others	252	2.48	1.232

5.4.7 Continued Use of Moodle

In this study, the continued use construct measures pre-service teachers' continued use of the Moodle LMS after its acceptance. The results in Table 5.10 show that all the mean values were less than 3. This means that the majority of pre-service teachers have intentions to continue using Moodle.

Table 5.17: Continued use of Moodle (N = 252)

Continued use of Moodle	N	Mean	Std Deviation
I depend on Moodle for most of my academic work	252	2.48	1.12
I would like to use Moodle in all my modules	252	2.5	1.145
I will continue using Moodle until I finish my studies	252	2.36	1.056
I have the necessary knowledge to continue using Moodle	252	2.44	1.174
I plan to use Moodle in my future teaching practice	252	2.51	1.088

5.4.8 Actual Use

Actual use in this study refers to the resultant construct which measures the extent to which pre-service teachers actually use the Moodle LMS at their disposal. The results of this construct are shown in Table 5.11, which indicates that all the mean values were less than 3, indicating that the pre-service teachers agreed to continue using Moodle.

Table 5.18: Actual use (N = 252)

Actual use of Moodle	N	Mean	Std Deviation
I login to Moodle several times per week.	252	2.35	1.051
On average I spend more than an hour each time I login to Moodle.	252	2.34	1.151
I use Moodle to access my notes.	252	2.56	1.133
I use Moodle for assessments.	252	2.43	1.082

5.4.9 Computer Self-Efficacy

The computer self-efficacy construct in this study measures the personal belief in pre-service teachers' own ability to complete tasks and reach goals using the Moodle LMS. The results in Table 5.12 show that all the mean values were less than 3, meaning that the majority of pre-service teachers believe in their ability to complete their learning tasks using Moodle.

Table 5.19: Computer self-efficacy (N = 252)

Computer self-efficacy	N	Mean	Std Deviation
I can use Moodle even if there is no one to show me how to do it.	252	2.47	1.134
I can use Moodle even if I have never used it before.	252	2.42	1.187
I can use Moodle if I have only the online instructions for reference.	252	2.84	1.207
I can use Moodle if I have seen someone else use it before.	252	2.52	1.352
I can use Moodle if I am given time to familiarise myself with it.	252	2.36	1.154
I can use Moodle if someone shows me how to do it.	252	2.38	1.203
I can use Moodle if I had used a similar systems before.	252	2.42	1.146
I can use Moodle if I have the built-in help facility for assistance.	252	2.17	1.026
I believe I have the ability to install the software to access Moodle.	252	1.90	1.082

5.4.10 Subjective Norm

Subjective norm is the degree to which an individual perceives that important persons believe they should use a new technology. The results in Table 5.13 show that the range of the mean values of the construct were from 2.03 to 2.21. This means that most pre-service teachers were influenced by what people around them say about the

use of Moodle. This means for pre-service teachers, the influence for them to use Moodle was mostly coming from their friends.

Table 5.20: Subjective norm (N = 252)

Subjective norm	N	Mean	Std Deviation
My friends think that I should use Moodle for my studies.	252	2.03	1.011
My lecturers think that I should use Moodle for my studies.	252	2.21	1.196
My colleagues at the university think that I should use Moodle.	252	2.12	1.118
Important people to me think that I should use Moodle.	252	2.2	1.134
My peers think that I should use Moodle for my studies.	252	2.25	1.194

5.4.11 Perceived Attitude

Perceived attitude is defined as a person's overall affective reaction toward the utilisation of new technology. The descriptive statistics for the construct perceived attitude are shown in Table 5.14. The results show that the range of the mean values was from 2.02 to 2.52. All the mean values were less than 3. These results imply that pre-service teacher have a positive attitude towards the use of Moodle.

Table 5.21: Perceived Attitude (N = 252)

Perceived attitude	N	Mean	Std Deviation
Using Moodle is a good idea.	252	2.08	1.107
I feel that using Moodle is pleasant.	252	2.52	1.216
I feel that it is desirable to use Moodle.	252	2.02	1.086
In my view using Moodle is a wise idea.	252	2.42	1.226

5.5 Analysis and Results of the PLS Approach

In this study, the hypotheses that were developed in Chapter Three were tested using PLS-SEM (SmartPLS 3). The study followed the two-step approach of model analysis suggested by Hair Jr et al. (2016). The measurement model was assessed first, followed by the structural equation. The subsections that follow present analysis of results of the measurement and structural models.

5.5.1 Measurement Model

According to Hair et al. (2016), the measurement model establishes the relationship between latent variables and their respective items. This assessment assesses if a latent variable can be included in the structural model (Garson, 2016). The validation of a reflective measurement model is established by testing indicator reliability, internal consistency, convergent validity, and discriminant validity (Garson, 2016).

5.5.1.1 Internal Consistency Reliability

The Cronbach's alpha and the composite reliability were used to assess the internal consistency reliability of the measurement model (see section 4.9 in Chapter Four). According to Hair et al. (2014), each latent variable's composite reliability and Cronbach's alpha test values should be greater or equal to 0.7. Figure 5.1 and Figure 5.2 show the results of Cronbach's alpha and the composite reliability test, respectively. The results showed that the constructs' Cronbach's alpha and the composite reliability values were greater than 0.7, indicating acceptable internal consistency reliability.

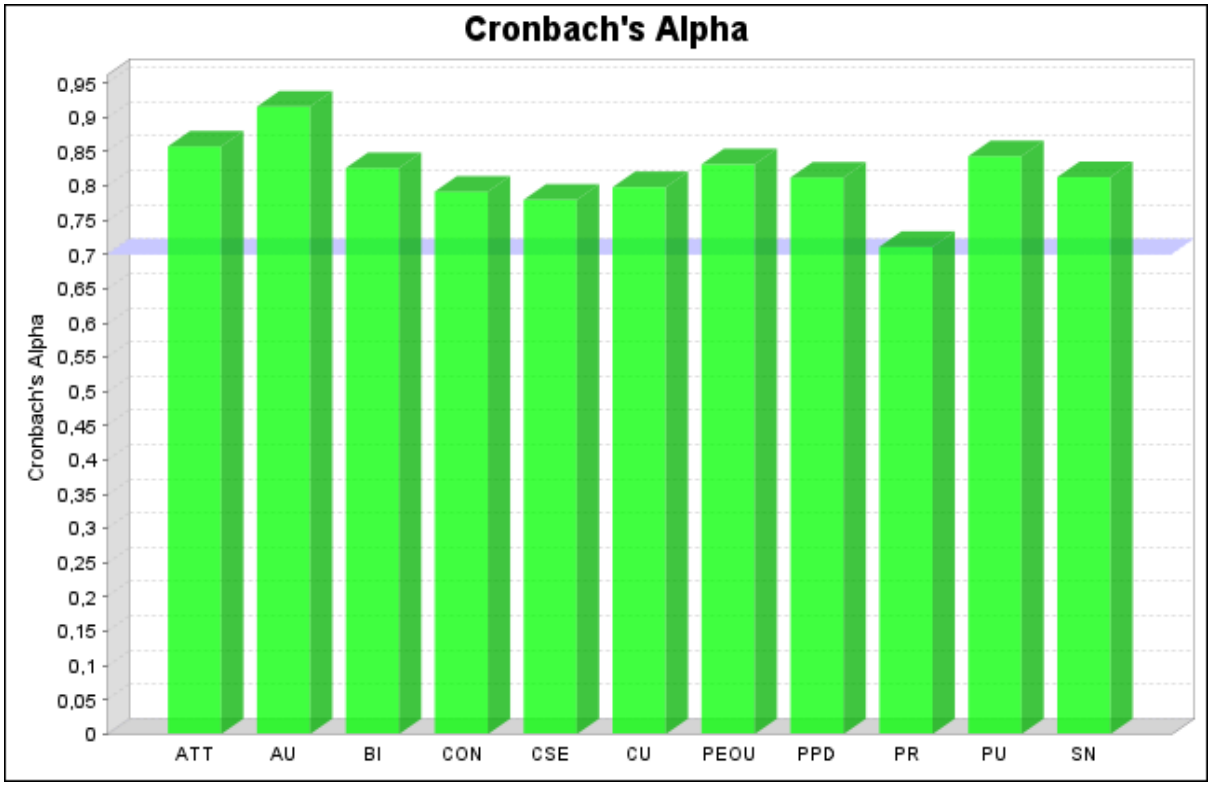

Figure 5.12: Cronbach's alpha

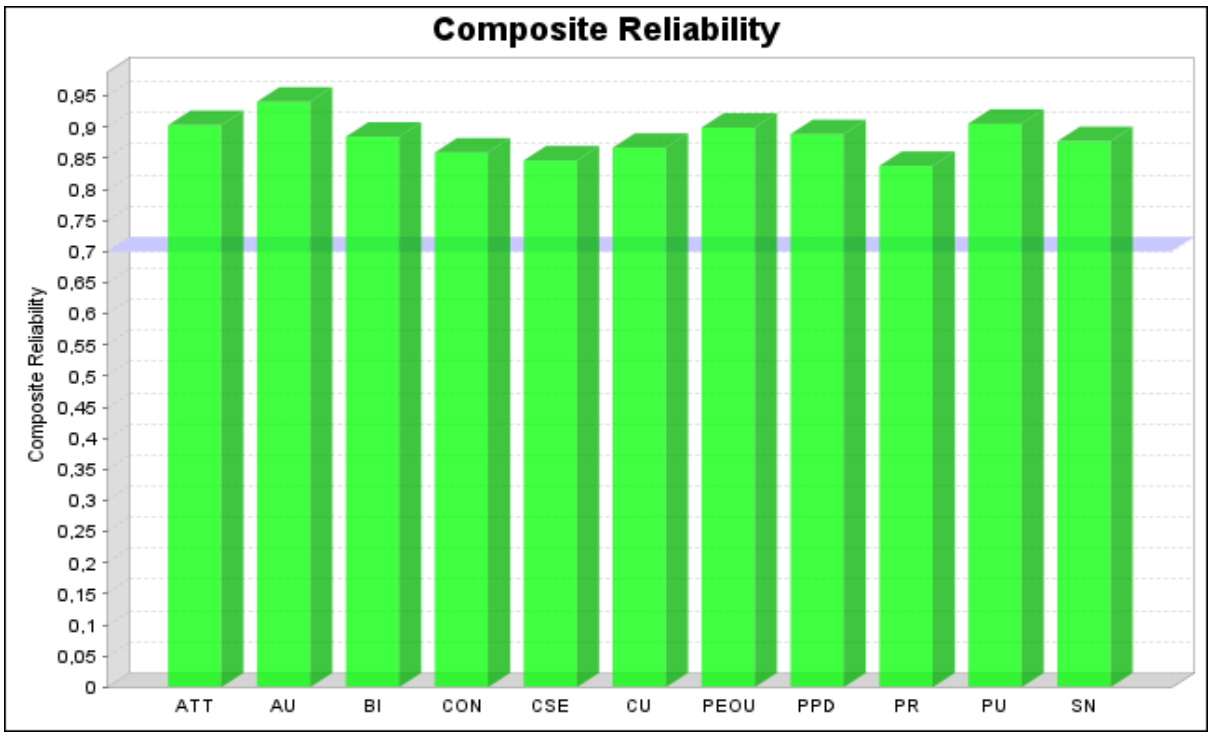

Figure 5.13: Composite reliability

5.5.1.2 Indicator Reliability

Indicator reliability is considered a form of item reliability coefficients for reflective models (Garson, 2016). It shows which part of the indicator's variance can be explained by the underlying latent variable (Götz et al., 2010). The outer loadings are used to assess indicator reliability. According to Hair Jr et al. (2016), the closer the outer loadings are to 1.0, the more reliable is that latent variable. According to Chin (1998), a construct should explain at least 50% of the item's variance. Hair et al. (2014) suggested that the threshold value of outer loadings should be 0.7, which is slightly less than the square root of 0.5. Hair et al. (2014) stated that the items whose outer loadings are between 0.4 and 0.7 should be removed by carefully examining the effects of removing on the composite reliability and construct's content validity.

Following the 0.7 rule of thumb by Hair et al. (2016), the outer loadings were assessed using SmartPLS 3 software. The indictors with outer loading below 0.4 were all removed (Hair et al., 2016). The indicators which were removed because they had outer loadings less than 0.4 were CON1, CON2, CON5, PPD5, PPD6, CSE3, PR3, PR4, and CU2. The indicators with outer loadings between 0.4 and 0.7 were removed one by one only if the indicators' removal improved the construct's composite reliability and average variance extracted (AVE). The indicators which were removed because the construct's composite reliability and average variance extracted increased after they were removed from the model were CON6, CON8, PPD2, PPD3, PPD4, PPD7, PU4, PU5, PEOU1, PEOU5, CSE5, CSE8, CSE9, and SN4. The following constructs were not removed from the model even though their outer loadings were less than 0.7: CU1 (0.642), CU5 (0.684), AU3 (0.672), CSE6 (0.662), CSE5 (0.532), and CON3 (0.697). These indicators were not removed because removing them did not increase their construct's composite reliability and average variance extracted. Additionally, these were returned because of their contribution to content validity (Hair et al., 2014). Table 5.15 shows the outer loadings of all the indictors which were used in this study.

Table 5.22: Indicator reliability (N = 252)

Construct	Indicator	Outer loading	Construct	Indicator	Outer loading
Perceived attitude	ATT1	0.754	Continued use	CU1	0.642
	ATT2	0.779		CU3	0.739
	ATT3	0.805		CU4	0.811
	ATT4	0.765		CU5	0.684
Actual use	AU1	0.754	Perceived ease of use	PEOU2	0.825
	AU2	0.727		PEOU3	0.794
	AU3	0.672		PEOU4	0.810
	AU4	0.702	Preparedness	PPD1	0.762
Behavioural intention	BI1	0.705		PPD8	0.799
	BI2	0.790		PPD9	0.782
	BI3	0.761	Perceived resources	PR1	0.721
	BI4	0.770		PR2	0.855
Confidence	CON3	0.697		PR5	0.860
	CON4	0.760	Perceived usefulness	PU1	0.830
	CON7	0.763		PU2	0.778
	CON9	0.836		PU3	0.831
Computer self-efficacy	CSE1	0.721	Subjective norm	SN1	0.705
	CSE2	0.706		SN2	0.857
	CSE4	0.532		SN3	0.752
	CSE6	0.662		SN5	0.836
	CSE7	0.697			

5.5.1.3 Convergent Validity

Convergent validity assesses the degree to which there is a high correlation between the latent variables which are theoretically identical (Hair et al., 2014). The average variance extracted values were used to assess the convergent validity of the measurement model. The convergent validity is established if the average variance extracted values of the constructs are 0.5 and above. The results in Figure 5.3 shows that the range of the average variance extracted values were from 0.527 to 0.800. All the average variance extracted values were greater than 0.5, indicating satisfactory convergent validity.

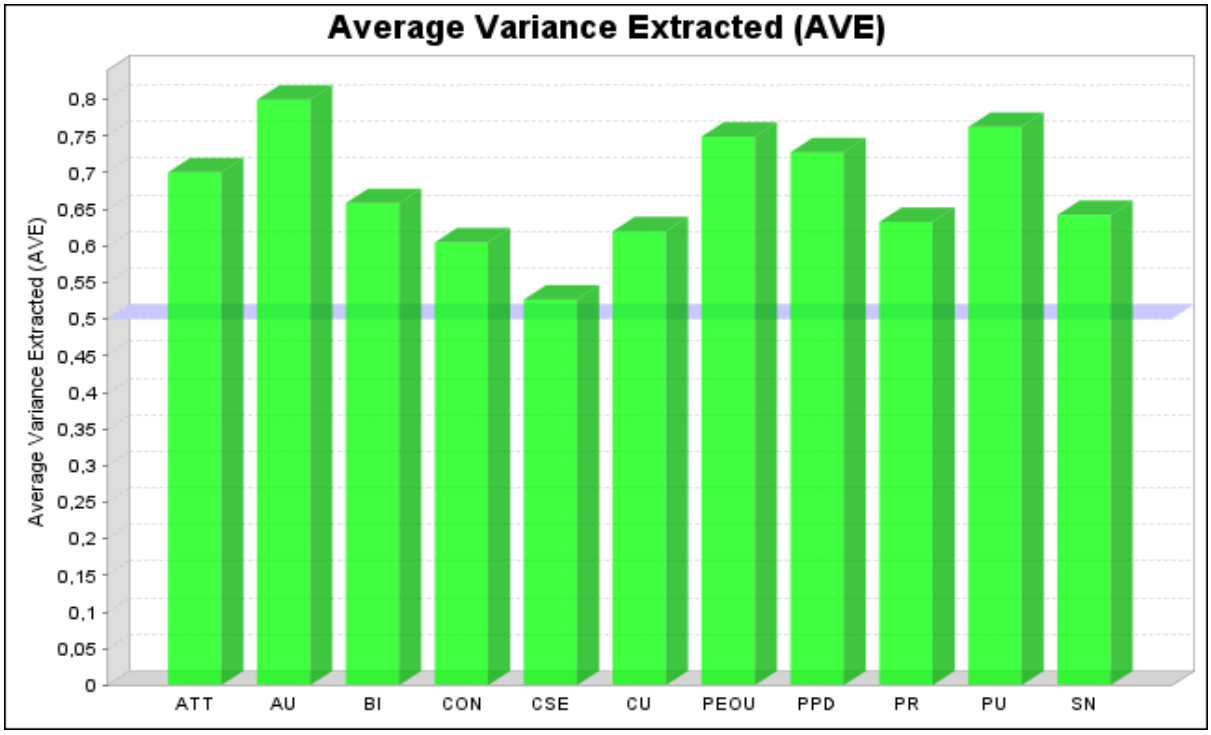

Figure 5.14: Average variance extracted

5.5.1.4 Discriminant Validity

Discriminant validity assesses the degree to which a construct differs from other constructs (Chin, 1998). This study followed the suggestion that discriminant validity is assessed by cross-loadings, Heterotrait-monotrait ratio (HTMT) and Fornell and Larcker criterion (Hair Jr et al., 2016).

5.5.1.4.1 Analysis of Fornell-Larcker Criterion

The correlation matrix for the latent variables is shown in Table 5.16, where the values in bold represent the square roots of the average variance extracted. The values that are not in bold represent the inter-correlation value between latent variables. The results in Table 5.16 show that values in bold are greater than the values that are not in bold. The results indicate that for any latent variable in the model, the variance shared with its block of indicators is greater than the variance it shares with any other latent variable. Consequently, the measurement model satisfied the Fornell-Larcker criterion of the discriminant validity and showed that all the constructs were distinct from each other.

Table 5.23: Fornell-Larcker criterion (N = 252)

	ATT	AU	BI	CON	CSE	CU	PEOU	PPD	PR	PU	SN
ATT	**0.837**										
AU	0.416	**0.894**									
BI	0.286	0.714	**0.811**								
CON	0.363	0.466	0.425	**0.778**							
CSE	0.350	0.343	0.283	0.547	**0.726**						
CU	0.422	0.449	0.372	0.456	0.619	**0.787**					
PEOU	0.140	0.485	0.488	0.262	0.130	0.209	**0.866**				
PPD	0.315	0.488	0.423	0.611	0.563	0.373	0.342	**0.853**			
PR	0.213	0.652	0.706	0.325	0.215	0.382	0.589	0.349	**0.796**		
PU	0.435	0.635	0.394	0.427	0.392	0.460	0.376	0.602	0.298	**0.873**	
SN	0.541	0.563	0.341	0.409	0.604	0.626	0.215	0.389	0.242	0.710	**0.801**

5.5.1.4.2 Cross Loadings

The output of the cross-loadings between the latent variables and items is shown in Table 5.17. Those denoted by the values in bold across constructs are its indicators. For instance, the loadings of indicators AU1, AU2, AU3, and AU4, into actual use were 0.834, 0.908, 0.905, and 0.925 respectively. These loadings were higher than the loadings of the same indicators in other constructs. The results indicated that the measurement model had demonstrated the acceptable discriminant validity.

Table 5.24: Cross loadings (N = 252)

	ATT	AU	BI	CON	CSE	CU	PEOU	PPD	PR	PU	SN
ATT1	**0.806**	0.353	0.250	0.286	0.313	0.379	0.123	0.248	0.241	0.332	0.449
ATT2	**0.865**	0.356	0.251	0.328	0.301	0.360	0.160	0.282	0.149	0.425	0.459
ATT3	**0.869**	0.369	0.266	0.363	0.282	0.344	0.126	0.295	0.187	0.378	0.454
ATT4	**0.806**	0.312	0.179	0.222	0.275	0.333	0.043	0.219	0.136	0.306	0.454
AU1	0.346	**0.834**	0.563	0.432	0.327	0.370	0.373	0.460	0.455	0.589	0.497
AU2	0.365	**0.908**	0.676	0.405	0.328	0.419	0.434	0.466	0.626	0.565	0.506
AU3	0.413	**0.905**	0.638	0.401	0.270	0.424	0.458	0.358	0.614	0.560	0.511
AU4	0.366	**0.928**	0.670	0.430	0.300	0.392	0.466	0.457	0.629	0.559	0.500
BI1	0.178	0.563	**0.787**	0.293	0.182	0.286	0.415	0.308	0.702	0.242	0.187
BI2	0.151	0.507	**0.839**	0.351	0.257	0.305	0.433	0.352	0.633	0.251	0.224
BI3	0.279	0.489	**0.731**	0.346	0.230	0.276	0.297	0.337	0.324	0.393	0.352
BI4	0.323	0.725	**0.880**	0.395	0.254	0.338	0.421	0.380	0.580	0.409	0.361
CON3	0.298	0.312	0.325	**0.772**	0.504	0.277	0.176	0.465	0.206	0.278	0.329
CON4	0.251	0.286	0.298	**0.738**	0.397	0.195	0.150	0.418	0.204	0.261	0.259
CON7	0.276	0.348	0.240	**0.781**	0.366	0.317	0.125	0.421	0.119	0.332	0.320
CON9	0.300	0.450	0.421	**0.817**	0.442	0.516	0.306	0.559	0.404	0.408	0.347
CSE1	0.221	0.287	0.222	0.306	**0.671**	0.600	0.190	0.381	0.236	0.312	0.443
CSE2	0.296	0.253	0.207	0.366	**0.746**	0.362	0.112	0.480	0.143	0.297	0.407
CSE4	0.342	0.272	0.224	0.549	**0.795**	0.473	0.046	0.439	0.146	0.302	0.466
CSE6	0.219	0.218	0.190	0.403	**0.777**	0.401	0.052	0.400	0.102	0.299	0.477
CSE7	0.149	0.181	0.172	0.392	**0.625**	0.354	0.014	0.311	0.132	0.144	0.394
CU1	0.378	0.410	0.293	0.332	0.472	**0.788**	0.157	0.225	0.265	0.438	0.568
CU3	0.356	0.396	0.325	0.270	0.444	**0.814**	0.224	0.266	0.329	0.438	0.560
CU4	0.337	0.336	0.302	0.211	0.428	**0.797**	0.160	0.231	0.356	0.271	0.453
CU5	0.267	0.278	0.259	0.546	0.567	**0.750**	0.125	0.411	0.269	0.293	0.394
PEOU2	0.098	0.414	0.450	0.269	0.113	0.191	**0.818**	0.263	0.456	0.385	0.228
PEOU3	0.117	0.436	0.408	0.178	0.057	0.135	**0.877**	0.291	0.510	0.266	0.132
PEOU4	0.148	0.409	0.408	0.229	0.163	0.213	**0.900**	0.333	0.561	0.321	0.194
PPD1	0.246	0.413	0.363	0.612	0.497	0.274	0.287	**0.843**	0.250	0.455	0.323
PPD8	0.342	0.430	0.355	0.449	0.506	0.373	0.281	**0.809**	0.344	0.541	0.354
PPD9	0.204	0.399	0.361	0.510	0.431	0.295	0.306	**0.905**	0.290	0.535	0.313
PR1	0.120	0.456	0.463	0.140	0.086	0.254	0.627	0.170	**0.792**	0.131	0.091
PR2	0.159	0.501	0.561	0.183	0.121	0.284	0.375	0.230	**0.788**	0.171	0.155
PR5	0.222	0.589	0.653	0.428	0.289	0.366	0.403	0.416	**0.807**	0.388	0.317
PU1	0.412	0.607	0.371	0.372	0.336	0.413	0.384	0.536	0.312	**0.896**	0.615
PU2	0.348	0.505	0.370	0.359	0.349	0.425	0.288	0.486	0.269	**0.825**	0.581
PU3	0.377	0.547	0.293	0.386	0.344	0.370	0.308	0.554	0.200	**0.897**	0.664
SN1	0.347	0.496	0.280	0.310	0.558	0.548	0.170	0.293	0.224	0.561	**0.828**
SN2	0.330	0.390	0.264	0.295	0.508	0.494	0.161	0.272	0.148	0.528	**0.768**
SN3	0.423	0.414	0.245	0.340	0.553	0.581	0.148	0.353	0.171	0.617	**0.856**
SN5	0.623	0.503	0.308	0.362	0.315	0.380	0.210	0.323	0.231	0.564	**0.748**

5.5.1.4.3 Heterotrait-Monotrait Ratio (HTMT)

According to Garson (2016), in a well-fitting model, heterotrait correlations should be smaller than monotrait correlations, meaning that the HTMT ratio should be below 1.0. Hair et al. (2014) suggested that if the HTMT value are below 0.9, discriminant validity has been established between a given pair of reflective constructs. The results in Table 5.18 show that all the HTMT values were below 0.9, indicating that discriminant validity was established.

Table 5.25: Heterotrait-Monotrait ratio values (N = 252)

	ATT	AU	BI	CON	CSE	CU	PEOU	PPD	PR	PU	SN
ATT											
AU	0.469										
BI	0.337	0.809									
CON	0.429	0.523	0.509								
CSE	0.412	0.393	0.348	0.703							
CU	0.513	0.526	0.459	0.492	0.744						
PEOU	0.160	0.555	0.582	0.296	0.159	0.257					
PPD	0.367	0.562	0.517	0.744	0.690	0.441	0.415				
PR	0.269	0.801	0.895	0.382	0.270	0.508	0.764	0.444			
PU	0.505	0.722	0.479	0.499	0.459	0.557	0.445	0.723	0.373		
SN	0.646	0.654	0.424	0.498	0.754	0.776	0.260	0.474	0.309	0.857	

The measurement model demonstrated satisfactory internal consistency reliability, indicator reliability, convergent validity, and discriminant validity. Therefore, measurement model established the ample robustness required to evaluate the structural model.

5.5.2 Structural Model

Once the internal consistency reliability, indicator reliability, convergent validity, and discriminant validity of the measurement model were confirmed, the next step was to assess the structural model. The structural model establishes the relationships between the constructs of the model. This section focuses on the results of the structural model evaluation in five steps.

5.5.2.1: Multicollinearity Assessment

Multicollinearity exists when two or more independent variables are highly intercorrelated (Garson, 2016). According to Garson (2016), multicollinearity inflates standard errors, makes significance tests of exogenous variable unreliable, and prevents the researcher from assessing the relative importance of one exogenous variable compared to another. The rule of thumb is that problematic multicollinearity may exist when the variance inflation factor (VIF) coefficient is higher than 4.0 (Hair et al., 2016). The results in Table 5.19 show that the range of the VIF values was from 1.000 to 1.656. All the VIF values were less than 4, indicating the absence of multicollinearity.

Table 5.26: Variance inflation factor values (N = 252)

	ATT	**AU**	**BI**	**CON**	**CU**	**PEOU**	**PPD**	**PU**
ATT			1.256					
AU				1.000	1.394		1.000	
BI		1.000						
CON					1.697			
CSE						1.586		1.592
PEOU	1.164		1.656					1.549
PPD					1.743			
PR			1.574			1.071		1.582
PU	1.164		1.411					
SN						1.607		1.626

5.5.2.2: Structural Model Path Coefficients

After confirming the absence of multicollinearity, the model's path coefficients were assessed using the t-tests. As recommended by Chin (1998), bootstrapping (with 5000 subsamples) was performed to test the statistical significance of each path coefficient using t-tests. The results are shown in Table 5.20.

Table 5.27: Path coefficients (N = 252)

Hypothesis	Path	Std Beta	Std Error	T Statistics	P Values	Decision
H13	ATT -> BI	0.584	0.062	9.373	0.000	Accepted
H16	AU -> CON	0.557	0.058	9.645	0.000	Accepted
H15	AU -> CU	0.544	0.067	8.168	0.000	Accepted
H17	AU -> PPD	0.595	0.050	11.863	0.000	Accepted
H14	BI -> AU	0.701	0.036	19.231	0.000	Accepted
H18	CON -> CU	-0.006	0.053	0.116	0.907	Rejected
H3	CSE -> PEOU	0.587	0.055	10.627	0.000	Accepted
H4	CSE -> PU	0.585	0.100	5.860	0.000	Accepted
H9	PEOU -> ATT	0.238	0.067	3.546	0.000	Accepted
H10	PEOU -> BI	0.286	0.057	5.000	0.000	Accepted
H8	PEOU -> PU	0.115	0.090	1.275	0.202	Rejected
H19	PPD -> CU	0.373	0.077	4.821	0.000	Accepted
H5	PR -> PEOU	0.347	0.072	4.804	0.000	Accepted
H6	PR -> PU	0.240	0.072	3.325	0.001	Accepted
H11	PU -> ATT	0.128	0.055	2.331	0.020	Accepted
H12	PU -> BI	0.091	0.045	2.005	0.045	Accepted
H7	SN -> ATT	0.510	0.061	8.309	0.000	Accepted
H1	SN -> PEOU	-0.092	0.073	1.259	0.208	Rejected
H2	SN -> PU	-0.134	0.081	1.645	0.100	Rejected

The results in Table 5.20 show that four hypotheses (H1, H2, H8, and H18) were not supported by the data. The rest of the fifteen hypotheses were statistically significant, thereby signifying that most of the variables identified for this model were the most appropriate ones.

The SARUTAM's structural model is depicted in Figure 5.4, showing the path coefficients and R^2 values. The R-square values are shown inside the blue ellipses for endogenous latent variables (constructs). It consists of 11 constructs (PU, PEOU, ATT, BI, CU, PPD, SN, CON, CSE, PR, and AU). The last three (PR, CSE, and SN) are antecedents of PU and PEOU. PEOU predicts PU, and they are both predictors of ATT and BI. BI is a predictor of AU, which in turn influences CON, PPD, and CU. CU is also predicted be PPD and CON.

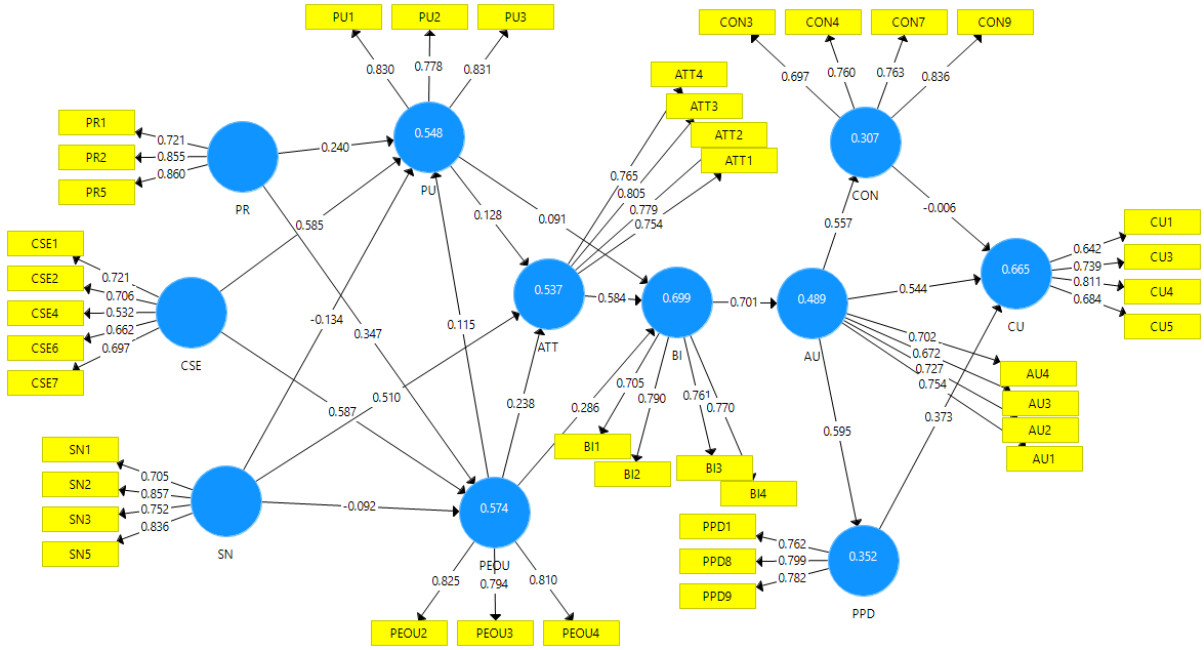

Figure 5.15: The SARUTAM model

5.5.2.3 Coefficient of Determination (R^2)

The R^2 value shows the amount of variance in a dependent variable that is explained by the independent variable (Hair et al., 2014). Consequently, the higher the R^2 value, the higher the predictive power of the structural model. According to Falk and Miller (1992), the R^2 value should be at least 0.1 or more. According Cohen et al. (2013), a R^2 value of 0.26, 0.13, and 0.02, respectively, describes substantial, moderate, or weak levels of predictive accuracy. Following the suggestion by Cohen et al. (2013), the R^2 values of CU (0.665), CON (0.307), PPD (0.352), AU (0.489), BI (0.699), ATT (0.537), PU (0.0548), and PEOU (0.574) are all considered substantial. The results imply that the total contribution of predictors to BI is an explained variance of 66.9%. The total variance explained by PEOU, SN, and PU in ATT is 53.7%. PEOU, PR, SN, and CSE explained 54.8% of the variance in PU. The external variables to TAM (SN, CSE, and PR) explained 57.4% of variance in PEOU. The total contribution of the TAM variables (PEOU, PU, BI, and ATT) and the external variables (CSE, PR, and SN) on the explained variance of AU is 48,9%. The TAM variables (PEOU, PU, BI, AU, and ATT) and the external variables (CSE, PR, and SN) explained a total of 30.7% and 35.2% in the explained variance of CON and PDD, respectively. The total contribution of all the model variables to explained variance of CU was 66.5%.

5.5.2.4 Effect Size (F-Square)

The f-square effect size measure is another name for the R^2 change effect (Garson, 2016). The f-squared is calculated using the following formula:

f-squared = (R^2 original – R^2 omitted)/ (1 - R^2 original), where

R^2 original is the R^2 value when the exogenous variable is part of the model.

R^2 omitted is the R^2 value when the exogenous variable is not part of the model.

According to Hair Jr et al. (2016), f-squared shows the total contribution that an exogenous variable contributes to the explained variance of the endogenous variable. Rahi (2012) stated that the f-squared measure is used to assess the relevant impact of a predictor construct on a dependent variable. This is assessed by observing the changes in the R^2 value of the endogenous variable if the exogenous variable is omitted in the model. According to Cohen et al. (2013), the acceptable effect size (f-squared) values of 0.02, 0.15, and 0.35 are considered small, medium, and substantial effect sizes, respectively. The results of the f-squared value are shown in Table 5.21.

Table 5.28: F-squared value (N = 252)

Hypothesis	Path	Std Beta	P Values	Decision	f^2
H13	ATT -> BI	0.584	0.000	Accepted	0.011
H16	AU -> CON	0.557	0.000	Accepted	0.277
H15	AU -> CU	0.544	0.000	Accepted	0.082
H17	AU -> PPD	0.595	0.000	Accepted	0.312
H14	BI -> AU	0.701	0.000	Accepted	1.037
H18	CON -> CU	-0.006	0.907	Rejected	0.067
H3	CSE -> PEOU	0.587	0.000	Accepted	0.004
H4	CSE -> PU	0.585	0.000	Accepted	0.005
H9	PEOU -> ATT	0.238	0.000	Accepted	0.001
H10	PEOU -> BI	0.286	0.000	Accepted	0.005
H8	PEOU -> PU	0.115	0.202	Rejected	0.077
H19	PPD -> CU	0.373	0.000	Accepted	0.030
H5	PR -> PEOU	0.347	0.000	Accepted	0.478
H6	PR -> PU	0.240	0.001	Accepted	0.511
H11	PU -> ATT	0.128	0.020	Accepted	0.210
H12	PU -> BI	0.091	0.045	Accepted	0.038
H7	SN -> ATT	0.510	0.000	Accepted	0.371
H1	SN -> PEOU	-0.092	0.208	Rejected	0.012
H2	SN -> PU	-0.134	0.100	Rejected	0.670

The results in Table 5.21 show that the exogenous variables of the following paths had a substantial effect size on their endogenous variables SN to ATT, PR to PU, PR to PEOU, and BI to AU. The paths AU to CON, AU to PPD, and PU to ATT had a moderate effect size, while all other paths had small effect sizes.

5.5.2.5 Blindfolding and Predictive Relevance (Q-Squared)

According to Garson (2016), the cross-validated redundancy for a reflectively modelled endogenous factor is the Stone-Gleisser Q^2 value. The Q^2 (cross-validated redundancy) is assessed using the blindfolding technique (Hair et al., 2014). Following the suggestion by Hair et al. (2014), this study used the blindfolding technique to evaluate the predictive relevance associated with each construct in the SARUTAM model. The algorithm was evaluated by systematically presuming that every 7^{th} case was missing from the responses, whereby the model parameters were then estimated and used to predict the missing values (Hair et al., 2014). The results in Table 5.22 show that the Q^2 values of all the dependent variables in the SARUTAM model.

Table 5.29: Predictive relevance (Q-squared) (N = 252)

	SSO	**SSE**	**Q^2 (=1-SSE/SSO)**
ATT	1008.000	691.699	0.314
AU	1008.000	758.839	0.247
BI	1008.000	610.939	0.394
CON	1008.000	829.804	0.177
CSE	1260.000	1260.000	
CU	1008.000	669.916	0.335
PEOU	756.000	481.932	0.363
PPD	756.000	593.856	0.214
PR	756.000	756.000	
PU	756.000	493.559	0.347
SN	1008.000	1008.000	

All the Q^2 values were greater than zero and, therefore, indicate that the SARUTAM model can be used to assess pre-service teachers' acceptance, confidence, and

preparedness to use learning management systems. Before focusing on answering research questions, the mediation and moderation effects of variables are considered.

5.6 Mediation

In SmartPLS, mediation occurs when a third mediator variable steps in between two other related constructs (Hair Jr et al., 2016). This means that in the PLS path model, a change in the exogenous construct causes a change in the mediator variable, which causes a change in the endogenous construct. The mediator value is also known as the total indirect effect of the mediator variable. Table 5.23 shows the results of the total indirect effect of the explanatory variables on the explained variable.

Table 5.30: Total indirect effect (N = 252)

	ATT	AU	BI	CON	CSE	CU	PEOU	PPD	PR	PU	SN
ATT		0,057		0,027		0,026		0,028			
AU						0,162					
BI				0,333		0,320		0,348			
CON											
CSE	0,030	0,012	0,017	0,006		0,006		0,006		0,014	
CU											
PEOU	0,102	0,073	0,042	0,034		0,033		0,036			
PPD											
PR	0,047	0,476	0,061	0,222		0,214		0,232		0,132	
PU		0,137	0,036	0,064		0,061		0,067			
SN	0,317	0,103	0,144	0,048		0,046		0,050		0,026	

The ultimate explained variable in the acceptance of the MLMS is actual use (AU). The results in Table 5.23 show that total indirect effect of each of the explanatory variables (ATT, CSE, PEOU, PR, PU, and SN) were positive.

5.7 Moderation of Continued Use Using Demographic Variables

To find the role played by demographics in PSTs' continued use of the MLMS, three demographic variables (age, level of study, and gender) were hypothesised to have an effect on the continued use variable through the confidence to use, the preparedness to use, and the actual use latent variables. This was done to establish whether demographic factors indeed influence the relationship between continued use of the MLMS and the factors that are perceived to influence it. The three demographic factors identified in this study were the age of respondents, their level of study, and gender.

5.7.1 Moderation Effect of the Age Variable

It was envisaged that the actual use of the MLMS has a positive effect on continued use of the same and that age moderates or enhances this relationship. This was the same for the confidence variable and the preparedness variable. The results of the moderation effect of the age variable on the stated constructs were calculated and presented in Table 5.24 and in Figure 5.5.

In Table 5.5, it can be seen that AU had a significant effect on CU (β=0,511, $p < 0.05$), PPD also had a significant effect on CU (β=0,382, $p < 0.05$) but the effect of CON on CU was not significant (β=0,001, $p < 0.05$). The corresponding *t*-values are shown in Figure 5.5.

The moderation effect of the age variable on the relationship Age-PPD-CU -> CU was positive but not significant (β=0,113, $p<0.05$). Those of age on actual use Age-AU-CU -> CU (β= -0,041, $p<0.05$) and on confidence Age-CON-CU -> CU (β= -0,006, $p<0.05$) were negative and equally not significant.

Table 5.31: Moderation effect of the age variable (N = 252)

Path	Std Beta	Std Error	T Statistics	P Values	Decision
Age-AU-CU -> CU	-0,041	0,102	0,407	0,684	Rejected
Age-CON-CU -> CU	-0,006	0,060	0,102	0,919	Rejected
Age-PPD-CU -> CU	0,113	0,070	1,627	0,104	Rejected
AU -> CON	0,557	0,059	9,500	0,000	Accepted
AU -> CU	0,511	0,065	7,889	0,000	Accepted
AU -> PPD	0,595	0,051	11,752	0,000	Accepted
Age -> CU	-0,043	0,039	1,113	0,266	Rejected
CON -> CU	0,001	0,055	0,020	0,984	Rejected
PPD -> CU	0,382	0,074	5,163	0,000	Accepted

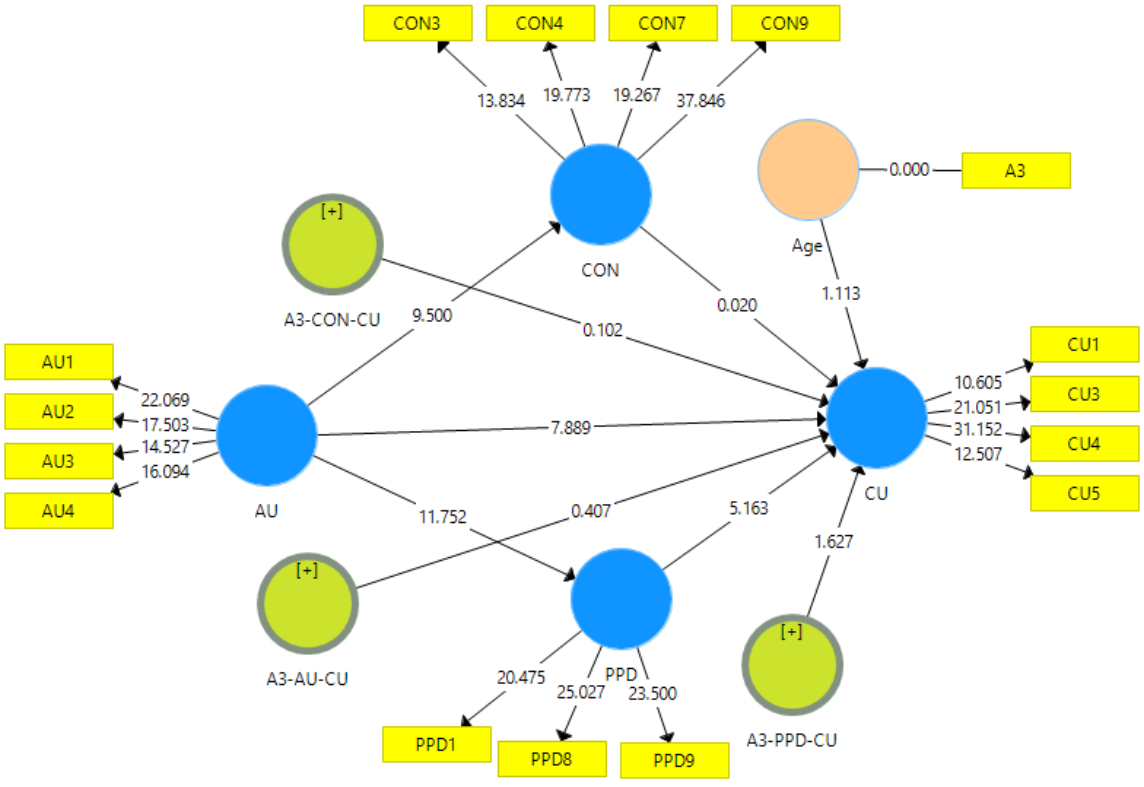

Figure 5.16: Moderation effect of the age variable

5.7.2 Moderation Effect of the Level of Study Variable

The study hypothesised that actual use of the MLMS has a positive effect on continued use of the same and that level of study of PSTs moderates this relationship. The same was envisaged for the confidence variable and the preparedness variable. The results in this regard showed that AU had a significant effect on CU (β=0,519, p < 0.05), PPD also had a significant effect on CU (β=0,393, p < 0.05) but the effect of CON on CU was not significant (β= -0,005, p < 0.05) (see Table 5.25). The corresponding t-values are shown in Figure 5.6.

The moderation effect of the level of study variable on the relationship level-CON-CU -> CU was positive but not significant (β=0,089, p<0.05). The level of study on actual use Level-AU-CU -> CU (β= -0,101, p<0.05) and that of preparedness Level-PPD-CU -> CU (β= -0,004, p<0.05) were negative and not significant.

Table 5.32: Moderation effect of the level of study variable (N = 252)

Path	Std Beta	Std Error	T Statistics	P Values	Decision
Level-AU-CU -> CU	-0,101	0,075	1,345	0,179	Rejected
Level-CON-CU -> CU	0,089	0,078	1,145	0,252	Rejected
Level-PPD-CU -> CU	-0,004	0,080	0,056	0,955	Rejected
AU -> CON	0,557	0,058	9,649	0,000	Accepted
AU -> CU	0,519	0,070	7,409	0,000	Accepted
AU -> PPD	0,595	0,050	11,883	0,000	Accepted
CON -> CU	-0,005	0,054	0,099	0,921	Rejected
Level -> CU	-0,052	0,040	1,304	0,192	Rejected
PPD -> CU	0,393	0,079	4,969	0,000	Accepted

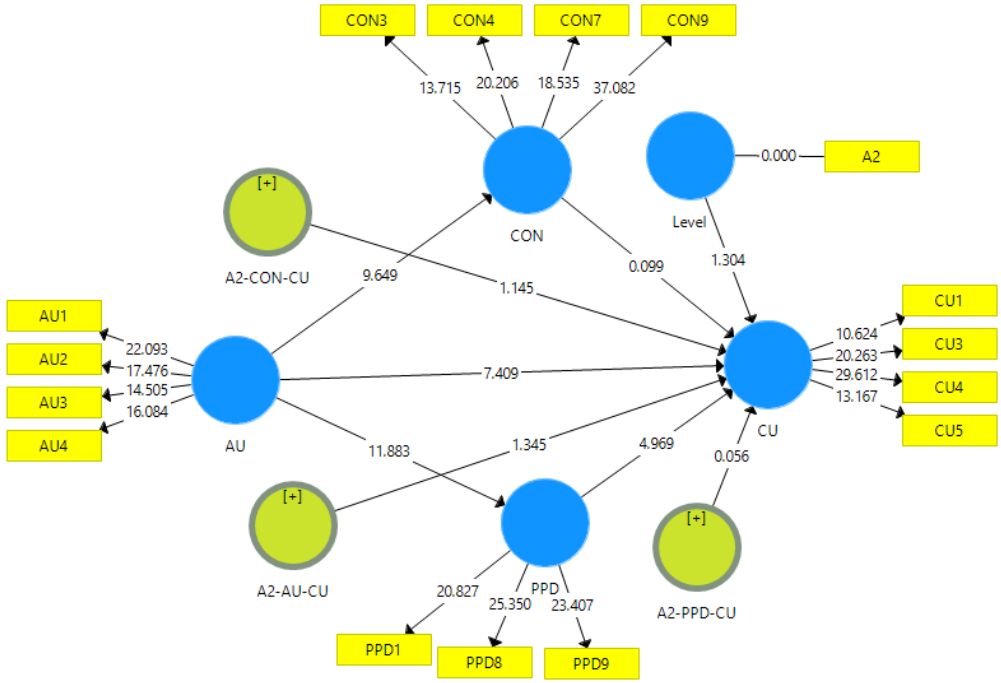

Figure 5.17: Moderation effect of the level of study variable

5.7.3 Moderation Effect of the Gender Variable

Lastly, the study hypothesised that actual use of the MLMS has a positive effect on continued use of the same and that the gender of participants moderates this relationship. The same was anticipated for the confidence variable and the preparedness variable. The results showed that AU had a significant effect on CU (β=0,574, p < 0.05), PPD also had a significant effect on CU (β=0,370, p < 0.05) but the effect of CON on CU was not significant and even negative (β= -0,014, p < 0.05) (see Table 5.26). The corresponding t-values are shown in Figure 5.7.

The moderation effect of gender on the relationship Gender-AU-CU ->CU was positive but not significant (β=0,056, p<0.05). That of gender on actual use Gender-CON-CU -> CU (β=0,006, p<0.05) and that of preparedness Level-PPD-CU -> CU (β=0,042, p<0.05) were not significant either.

Table 5.33: Moderation of the gender variable (N = 252)

Path	Std Beta	Std Error	T Statistics	P Values	Decision
Gender-AU-CU -> CU	0,056	0,064	0,881	0,378	Rejected
Gender-CON-CU -> CU	0,006	0,055	0,115	0,908	Rejected
Gender-PPD-CU -> CU	0,042	0,061	0,684	0,494	Rejected
AU -> CON	0,557	0,057	9,722	0,000	Accepted
AU -> CU	0,574	0,066	8,713	0,000	Accepted
AU -> PPD	0,595	0,049	12,045	0,000	Accepted
CON -> CU	-0,014	0,053	0,267	0,789	Rejected
Gender -> CU	0,059	0,035	1,673	0,094	Rejected
PPD -> CU	0,370	0,075	4,930	0,000	Accepted

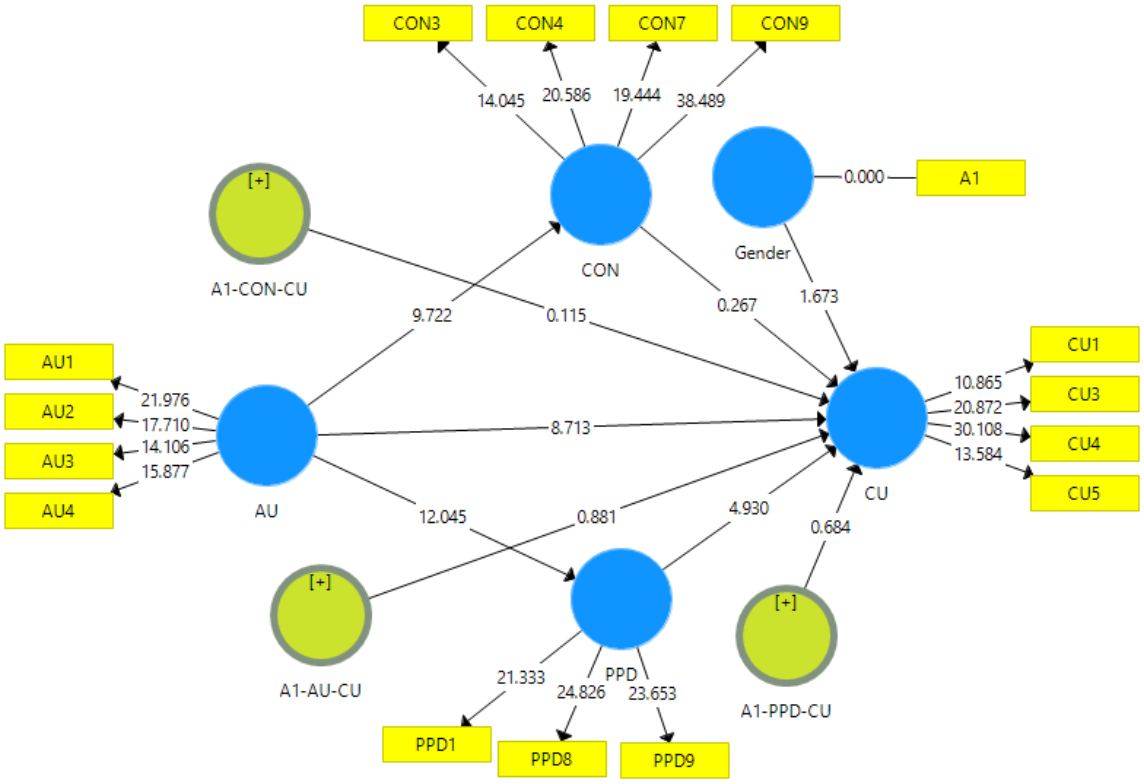

Figure 5.18: Moderation effect of the gender variable

5.8 Focus on Research Objectives

Once predictive relevance of the SARUTAM model was confirmed, the next step was to respond to the research objectives. The main model was broken down into smaller models that were used to respond to the research objectives. There were five research objectives altogether.

Research Objective 1: To examine the factors that predict pre-service teachers' acceptance of the Moodle LMS

To answer this research objective, the results in Figure 5.8 and Table 5.27 were used. The results in Figure 5.4 show that the R^2 value of actual use (AU) was 0.489. This R^2 value is considered substantial (Cohen et al., 2013). This result implies the predictors of AU contributed a total of 49.0% of its explained variance. Figure 5.5 consists of eight constructs which are TAM's variables (PU, PEOU, ATT, BI, and AU) and external variables (CSE, PR, and SN). The model shows that the external variables (CSE, PR, and SN) predicts PU and PEOU. SN also influence ATT. PEOU influence PU and they both predict ATT and BI. The model also shows that ATT predicts BI, which in turn predicts AU.

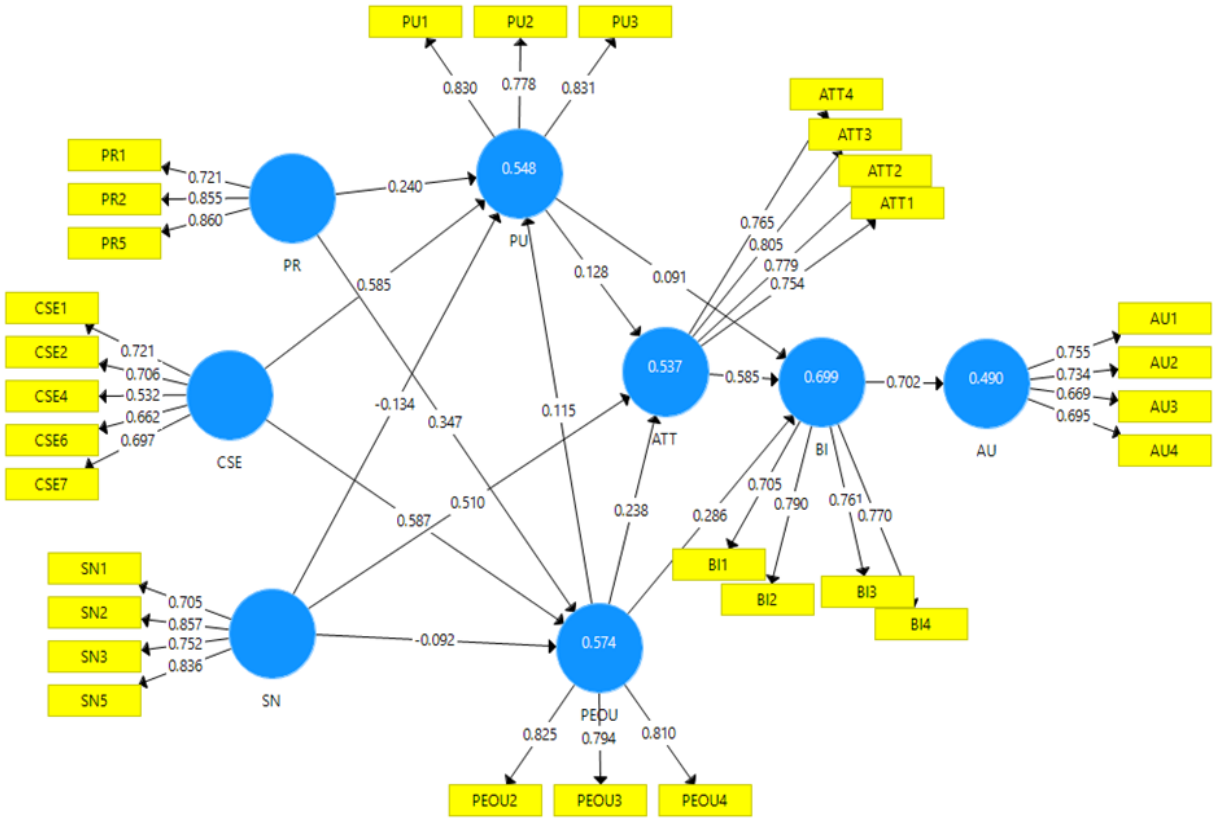

Figure 5.19: Pre-service teachers' acceptance of the Moodle LMS model

The results in Table 5.27 showed that out of 14 paths which were tested, only three were not statistically significant at 0.05 level. The three paths that were not significant were SN to PEOU (β = -0.092, p > 0.05), SN to PU (β = -0.134, p > 0.05), and PEOU to PU (β = 0.115, p > 0.05). The results mean that the data did not support hypotheses H1, H2, and H8.

A total of 11 paths were supported by data. Paths ATT to BI (β = 0.585, p < 0.05); BI to AU (β = 0.702, p < 0.05); CSE to PEOU (β = 0.587, p < 0.05); and CSE to PU (β = 0.585, p < 0.05) were significant in supporting hypotheses H13, H14, H3, and H4, respectively.

The results in Table 5.27 also show that *H6 (β = 0.240, p < 0.05); H9 (β = 0.238, p < 0.05); H10 (β = 0.286, p < 0.05); and H5 (β = 0.347, p < 0.05)*. The results in Table 5.23 also shows that the following hypotheses were significant at 0.05 level *H11 (β = 0.128, p < 0.05); H12 (β = 0.091, p < 0.05); and H7 (β = 0.510, p < 0.05)*.

Table 5.34: Predictors of acceptance of Moodle LMS hypotheses tests (N = 252)

Hypothesis	Path	Std Beta	Std Error	T Statistics	P Values	Decision
H13	ATT -> BI	0.585	0.062	9.373	0.000	Accepted
H14	BI -> AU	0.702	0.036	19.231	0.000	Accepted
H3	CSE -> PEOU	0.587	0.055	10.627	0.000	Accepted
H4	CSE -> PU	0.585	0.100	5.860	0.000	Accepted
H9	PEOU -> ATT	0.238	0.067	3.546	0.000	Accepted
H10	PEOU -> BI	0.286	0.057	5.000	0.000	Accepted
H8	PEOU -> PU	0.115	0.090	1.275	0.202	Rejected
H5	PR -> PEOU	0.347	0.072	4.804	0.000	Accepted
H6	PR -> PU	0.240	0.072	3.325	0.001	Accepted
H11	PU -> ATT	0.128	0.055	2.331	0.020	Accepted
H12	PU -> BI	0.091	0.045	2.005	0.045	Accepted
H7	SN -> ATT	0.510	0.061	8.309	0.000	Accepted
H1	SN -> PEOU	-0.092	0.073	1.259	0.208	Rejected
H2	SN -> PU	-0.134	0.081	1.645	0.100	Rejected

Research objective 2: To investigate the extent of pre-service teachers' confidence in using the Moodle LMS

The results in Table 5.28 and Figure 5.9 were used to answer this research objective. The results in Figure 5.6 shows that R^2 value of confidence (CON) was 0.308. This means that the explained variance of CON by all its predictors was 30.8%. This R^2 value is considered substantial (Cohen et al., 2013). Figure 5.6 consist of nine constructs (CON, AU, BI, ATT, PU, PEOU, PR, SN, and CSE). The model proposed that CON is predicted by AU. BI influences AU. The antecedents of BI are ATT, PU, and PEOU. The determinants of ATT are PU, PEOU, SN. Predictors SN, CSE, and PR influence PU and PEOU.

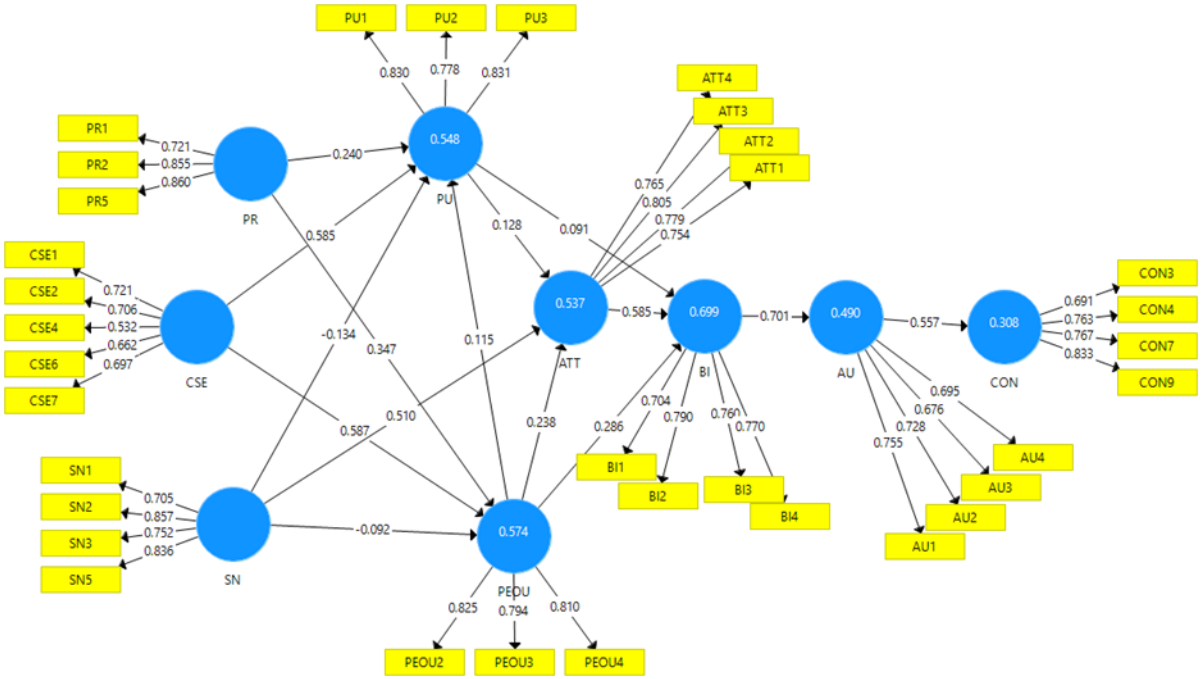

Figure 5.20: Pre-service teachers' confidence in using the Moodle model

Figure 5.9 and Table 5.28 show the path coefficients of the hypotheses tested. The results showed that 15 hypotheses were tested. Of the 15 hypotheses tested, only three were not significant. The three hypotheses which were not significant were *H1 (β = -0.092, p > 0.05), H2 (β = -0.134, p > 0.05), and H8 (β = 0.115, p > 0.05).*

The other 12 hypotheses were significant at 0.05 level. The hypotheses that were significant were *H16 (β = 0.557, p < 0.05); H13 (β = 0.585, p < 0.05); H14 (β = 0.701, p < 0.05); H3 (β = 0.587, p < 0.05); H4 β = 0.585, p < 0.05); H6 (β = 0.240, p < 0.05);*

H9 (β = 0.238, p < 0.05); H10 (β = 0.286, p < 0.05); H11 (β = 0.128, p < 0.05); H12 (β = 0.091, p < 0.05); H7 (β = 0.510, p < 0.05); and H5 (β = 0.347, p < 0.05).

Table 5.28: Preservice teachers' confidence in using the Moodle LMS (N = 252)

Hypothesis	Path	Std Beta	Std Error	T Statistics	P Values	Decision
H13	ATT -> BI	0.585	0.062	9.373	0.000	Accepted
H14	BI -> AU	0.701	0.036	19.231	0.000	Accepted
H3	CSE -> PEOU	0.587	0.055	10.627	0.000	Accepted
H16	AU -> CON	0.557	0.058	9.645	0.000	Accepted
H4	CSE -> PU	0.585	0.100	5.860	0.000	Accepted
H9	PEOU -> ATT	0.238	0.067	3.546	0.000	Accepted
H10	PEOU -> BI	0.286	0.057	5.000	0.000	Accepted
H8	PEOU -> PU	0.115	0.090	1.275	0.202	Rejected
H5	PR -> PEOU	0.347	0.072	4.804	0.000	Accepted
H6	PR -> PU	0.240	0.072	3.325	0.001	Accepted
H11	PU -> ATT	0.128	0.055	2.331	0.020	Accepted
H12	PU -> BI	0.091	0.045	2.005	0.045	Accepted
H7	SN -> ATT	0.510	0.061	8.309	0.000	Accepted
H1	SN -> PEOU	-0.092	0.073	1.259	0.208	Rejected
H2	SN -> PU	-0.134	0.081	1.645	0.100	Rejected

Research objective 3: To determine pre-service teachers' preparedness to use the Moodle LMS

The results in Table 5.29 and Figure 5.10 were used to determine pre-service teachers' preparedness to use the Moodle LMS at UNIZULU. The results in Table 5.29 show that out of the 15 hypotheses which were tested, 12 were statistically significant at 0.05 level.

The 12 hypotheses which were accepted were *H17 (β = 0.598, p < 0.05); H14 (β = 0.702, p < 0.05); H13 (β = 0.585, p < 0.05); H12 (β = 0.091, p < 0.05); H11 (β = 0.128, p < 0.05); H10 (β = 0.286, p < 0.05); H9 (β = 0.238, p < 0.05); H7 (β = 0.510, p < 0.05);*

H6 (β = 0.240, p < 0.05); H5 (β = 0.347, p < 0.05); H4 β = 0.585, p < 0.05); and H3 (β = 0.587, p < 0.05).

Three hypotheses *(H1 (β = -0.092, p > 0.05), H2 (β = -0.134, p > 0.05), and H8 (β = 0.115, p > 0.05))* were not statistically significant.

Table 5.35: Preservice teachers' preparedness to use the Moodle LMS (N = 252)

Hypothesis	Path	Std Beta	Std Error	T Statistics	P Values	Decision
H13	ATT -> BI	0.585	0.062	9.373	0.000	Accepted
H17	AU -> PPD	0.598	0.050	11.863	0.000	Accepted
H14	BI -> AU	0.702	0.036	19.231	0.000	Accepted
H3	CSE -> PEOU	0.587	0.055	10.627	0.000	Accepted
H4	CSE -> PU	0.585	0.100	5.860	0.000	Accepted
H9	PEOU -> ATT	0.238	0.067	3.546	0.000	Accepted
H10	PEOU -> BI	0.286	0.057	5.000	0.000	Accepted
H8	PEOU -> PU	0.115	0.090	1.275	0.202	Rejected
H5	PR -> PEOU	0.347	0.072	4.804	0.000	Accepted
H6	PR -> PU	0.240	0.072	3.325	0.001	Accepted
H11	PU -> ATT	0.128	0.055	2.331	0.020	Accepted
H12	PU -> BI	0.091	0.045	2.005	0.045	Accepted
H7	SN -> ATT	0.510	0.061	8.309	0.000	Accepted
H1	SN -> PEOU	-0.092	0.073	1.259	0.208	Rejected
H2	SN -> PU	-0.134	0.081	1.645	0.100	Rejected

Figure 5.10 shows the path coefficients and R^2 values of pre-service teachers' preparedness to use the Moodle LMS model. The R^2 value of PPD is 0.355. According to (Cohen et al., 2013), this R^2 value is considered substantial. The R^2 values imply that the total contribution of all the constructs on the model to the explained variance of PPD was 35.5%. The pre-service teachers' preparedness to use the Moodle LMS model consist of nine constructs: CSE, SN, PR, PEOU, PU, ATT, BI, AU, and PPD. CSE, SN and PR predicts PEOU and PU. PU is also predicted by PEOU, and they both predict ATT and BI. ATT predicts BI, which in turn predicts AU. AU predicts PPD.

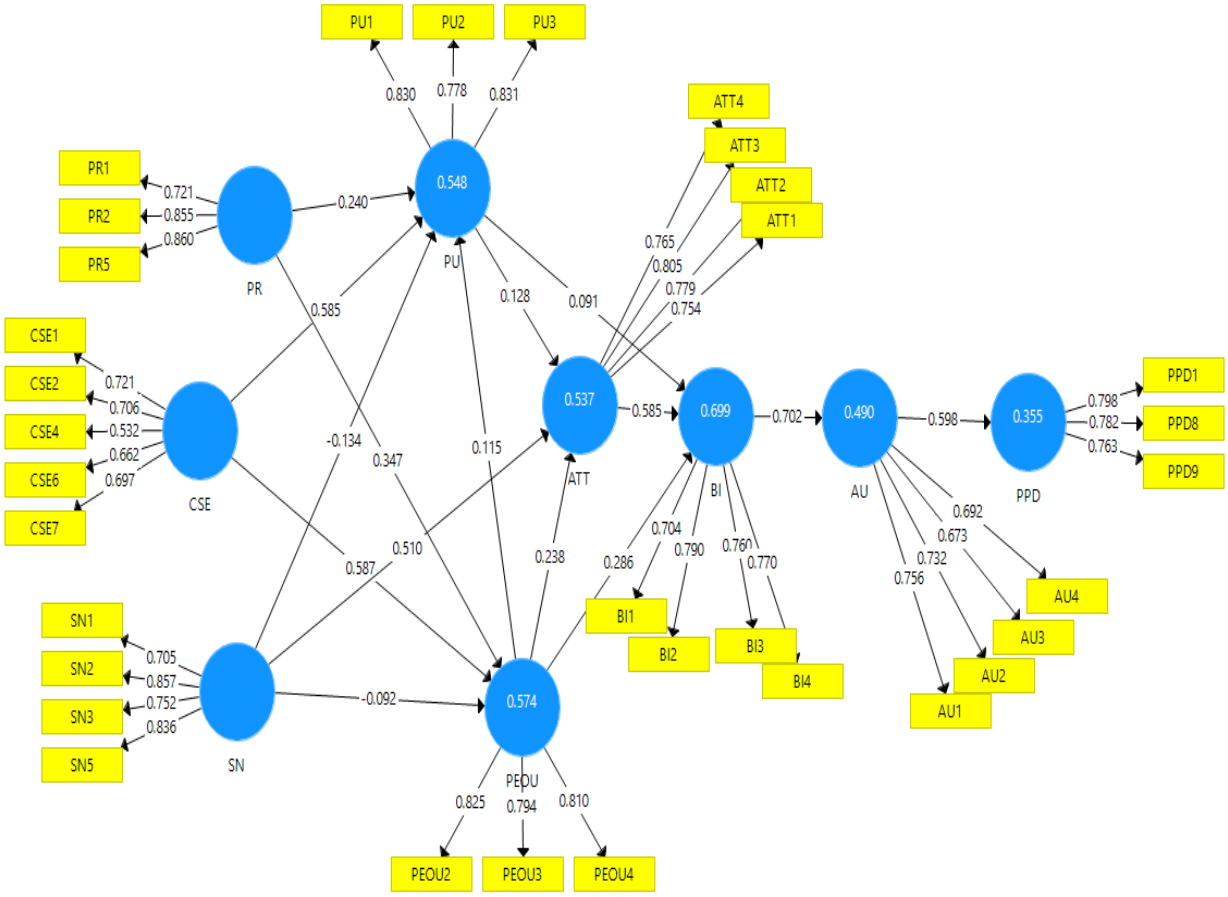

Figure 5.21: Pre-service teachers' preparedness to use the Moodle LMS model

Research objective 4: To establish the magnitude of pre-service teachers' continued use of the Moodle LMS

To provide answers for research objective 4, Table 5.30 and Figure 5.11 were used. Figure 5.11 shows the R^2 and the path coefficients for the pre-service teachers' continued use of the Moodle LMS model. The results in Figure 5.11 shows that the R^2 value of the pre-service teachers' continued use of the Moodle LMS model was 0.665. This R^2 value is considered substantial. This result implies that the total contribution of AU, CON, and PPD in the explained variance of CU was 66.6%. Figure 5.11 consist of four constructs: AU, CON, PPD, and CU. AU predicts all the three constructs (CON, PPD, and CU). PPD and CON are predictors of CU.

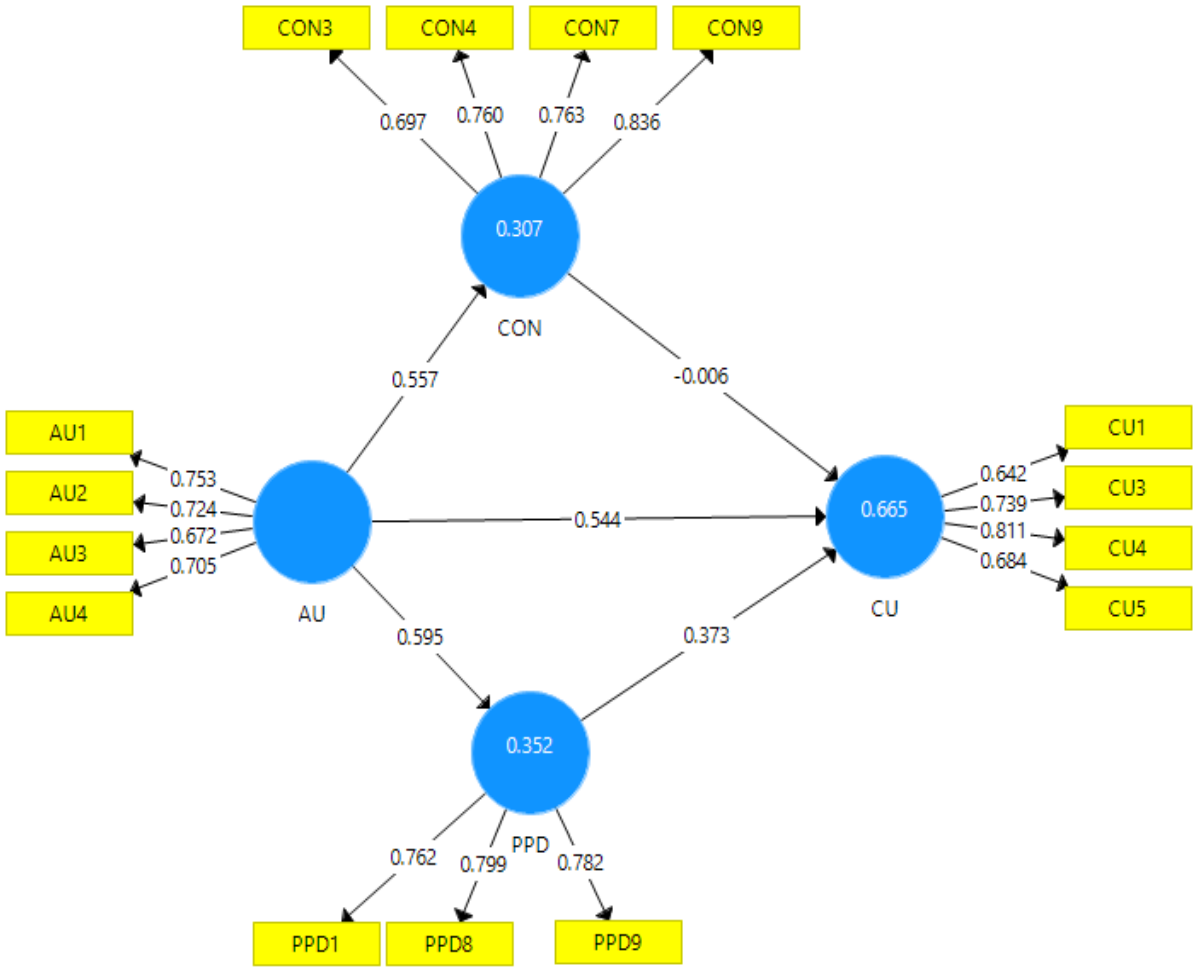

Figure 5.22: Pre-service teachers' continued use of the Moodle LMS model

Table 5.30 shows the results of five hypotheses which were tested. The results showed that one *(H18 (β = -0.006, p > 0.05))* of the five hypotheses tested was not significant. The other four hypotheses *H16 (β = 0.557, p < 0.05); H15 (β = 0.544, p < 0.05); H17 β = 0.595, p < 0.05);* and *H3 (β = 0.373, p < 0.05)* were significant at 0.05 level.

Table 5.36: Pre-service teachers' continued use of the Moodle LMS (N = 252)

Hypothesis	Path	Std Beta	Std Error	T Statistics	P Values	Decision
H16	AU -> CON	0.557	0.058	9.645	0.000	Accepted
H15	AU -> CU	0.544	0.067	8.168	0.000	Accepted
H17	AU -> PPD	0.595	0.050	11.863	0.000	Accepted
H18	CON -> CU	-0.006	0.053	0.116	0.907	Rejected
H19	PPD -> CU	0.373	0.077	4.821	0.000	Accepted

Research objective 5: To find out the role played by demographic data in pre-service teachers' continued use of the Moodle LMS

To answer this research objective, the results in Table 5.31, which are a summary of all the figures and tables in sections 5.6.1, 5.6.2, and 5.6.3, were used. These were the calculated moderation effects of PSTs' demographic influence on their continued use of the MLMS. The results showed that the age variable has a negative effect on the relationship between actual use and continued use, as well as on confidence to use and continued use but has a positive effect on the relationship preparedness to use and continued use. These effects are, however, negligibly small, and, hence, not statistically significant at 5% level of significance.

The results also showed that the level of study variable had a negative effect on the relationship between actual use and continued use and that of preparedness to use and continued use, but had a positive effect on the relationship between preparedness to use and continued use. Once again, these effects were not statistically significant.

For the gender variable, all three relationships were positive but not statistically significant at 5% level of significance. These moderation results imply that demographic variables have a negligible effect on the PSTs' continued use of the MLMS.

Table 5.37: Moderation effects of demographic data on continued use (N = 252)

Path	Std Beta	Standard error	T Statistics	P Values	Decision
Age-AU-CU -> CU	-0,041	0,102	0,407	0,684	Rejected
Age-CON-CU -> CU	-0,006	0,060	0,102	0,919	Rejected
Age-PPD-CU -> CU	0,113	0,070	1,627	0,104	Rejected
Level-AU-CU -> CU	-0,101	0,075	1,345	0,179	Rejected
Level-CON-CU -> CU	0,089	0,078	1,145	0,252	Rejected
Level-PPD-CU -> CU	-0,004	0,080	0,056	0,955	Rejected
Gender-AU-CU -> CU	0,056	0,064	0,881	0,378	Rejected
Gender-CON-CU -> CU	0,006	0,055	0,115	0,908	Rejected
Gender-PPD-CU -> CU	0,042	0,061	0,684	0,494	Rejected

5.9 Chapter Summary

This chapter focussed on the presentation and analysis of results of the study, wherein data were generated through a five-point Likert scale questionnaire (see Appendix 1). The presentation and analysis were divided into three distinct steps. The first step involved data cleaning to ensure the authenticity of the collected data in readiness for testing. The Statistical Package for Social Sciences (SPSS) was used for this purpose, together with descriptive statistics of respondents' demographic characteristics. The second stage focused on the assessment of the measurement model, where the SmartPLS version 3 was used to assess indicator reliability, internal consistency, convergent validity, and discriminant validity. The third stage focused on the evaluation of the structural model. In this stage, issues of multicollinearity, R-squared, f-squared, Q-squared, path coefficients, mediation, and moderation analyses were presented.

CHAPTER SIX

DISCUSSION OF RESULTS

6.1 Introduction

This study aimed to examine pre-service teachers' acceptance, confidence, and preparedness to use learning management systems in the context of a South African rural university**.** The previous chapter dealt with the data presentation and analysis of the results. The South African rural universities technology acceptance model (the SARUTAM), developed in Chapter Four (see Figure 3.4 in section 3.3.2), was empirically evaluated.

This chapter discusses the significance of the findings of the relationships proposed in the SARUTAM conceptual model. The research findings will be compared to those of prior studies raised in the literature section of this study and report on expected consistencies or inconsistencies thereof. In this chapter, the discussion of results followed the sequence of the five research objectives listed here below, which are centred on eleven constructs (see section 6.2):

1. To examine factors that predict pre-service teachers' acceptance of the MLMS.
2. To investigate the extent of pre-service teachers' confidence in using the MLMS.
3. To determine pre-service teachers' preparedness to use the MLMS.
4. To establish the magnitude of pre-service teachers' continued use of the MLMS.
5. To find out the role played by demographic data in pre-service teachers' acceptance of the MLMS.

The chapter has been organised into seven sections. Section 6.1 comprises of an introduction to the chapter. Section 6.2 discusses the results of the factors that predict pre-service teachers' acceptance of the MLMS. Section 6.3 deliberates on results of the extent of pre-service teachers' confidence in using the MLMS. The determination of pre-service teachers' preparedness to use the MLMS is discussed in section 6.4. The results of the magnitude of pre-service teachers' continued use of the MLMS are addressed in section 6.5. Section 6.6 debates the results of the role played by

demographic data in pre-service teachers' acceptance of the MLMS. Lastly, a summary of the chapter is presented in section 6.7.

6.2 Factors Predicting Pre-Service Teachers' Acceptance of the MLMS

The purpose of objective 1 was to examine the factors that predict pre-service teachers' acceptance of the MLMS. Based on the reviewed literature, the factors considered for this purpose included the three external variables that were added to the original TAM: pre-service teachers' subjective norms (SN); computer self-efficacy (CSE); and perceived resources (PR).

The following TAM variables were also included: perceived ease of use (PEOU) of the Moodle LMS; perceived usefulness (PU) of the Moodle LMS; attitude towards use (ATT); behavioural intention to use (BI) the Moodle LMS; and actual use (AU) of the Moodle LMS.

6.2.1 Subjective Norm

Subjective norm refers to the degree of individual attention influenced by the significant others' opinions that shape the performance of a particular behaviour (Al-Okaily et al., 2020). In this study, the SN construct had five indicators (Appendix 1), but one (SN4) was discarded during factor analysis because it had a loading of less than the 0.7 threshold (Garson, 2016). Each of these indicators had an average response rate of less than 3 (Appendix 3) from a five-point Likert scale ranging from 1 - strongly agree to 5 - strongly disagree. The average response rate of less than 3 means that PSTs agreed with all the indicators in the construct, implying that their decision to accept and use the MLMS was influenced by the opinions of their peers and those around them.

In the SARUTAM model (Figure 5.4), the construct had three hypotheses: *pre-service teachers' subjective norm has a positive effect on perceived ease of use of the Moodle LMS (H1), pre-service teachers' subjective norm has a positive effect on the perceived usefulness of the Moodle LMS (H2), and pre-service teachers' subjective norm has a positive effect on their attitude towards use of the Moodle LMS (H7). Empirical results showed that the first two hypotheses H1 (β= -0.092, p>0.05) and H2 (β= -0.134, p>0.05) were rejected while H7(β=0.510, p<0.05) was accepted.* This means that SN

had a statistically insignificant negative effect on both PEOU and PU, while having a significant positive influence on ATT.

The results of this study showed that two of the hypotheses (H1 and H2) were rejected, while one (H3) was accepted. These results were consistent with those of Tarhini et al. (2014), who found that the influence of SN on other constructs of TAM was quite contradictory. Some hypotheses were accepted, while others were rejected. By investigating various researches that employed the SN construct, Tarhini et al. (2014) found that 19 out of 22 (86%) studies showed that SN has a positive influence on PU. Abdullah and Ward (2016) also found that four out of the six studies showed that SN positively influenced PEOU. Aman et al. (2020) found that PSTs' subjective norm had an influence on the adoption of m-LMS.

6.2.2 Computer Self-Efficacy

Computer self-efficacy mean people's perceptions of their ability to use computer technologies (Compeau & Higgins, 1995; Zarafshani et al., 2020). In this study, the CSE construct had nine indicators (Appendix 1) but four (CSE3, CSE5, CSE8, and CSE9) were discarded during factor analysis because they had loadings of less than the 0.7 threshold (Garson, 2016). Each of these indicators had an average response of less than 3 (see Appendix 3) from a five-point Likert scale ranging from 1 - strongly agree to 5 - strongly disagree. The average response rate of less than 3 means that the PSTs agreed with all the indicators in the construct, implying that their perceptions on using computer technologies influenced their decision to accept the use of the MLMS.

Two hypotheses underpinned the CSE construct: *pre-service teachers' computer self-efficacy has a positive effect on perceived ease of use of the Moodle LMS (H3),* and *pre-service teachers' computer self-efficacy has a positive effect on perceived usefulness of the Moodle LMS(H4).*

The results from the model showed that both hypotheses *H3(β=0.587, p<0.05)*, and *H4(β=0.585, p<0.05)* were accepted. This means that CSE had a significant influence on both PEOU and PU, implying that PSTs believe that they can use most of the computer technologies that necessitate full utilisation of the Moodle LMS provided by their institution.

The results of hypotheses H3 and H4 agreed with those from other studies. In a quantitative meta-analysis of 107 studies in e-learning adoption, Abdullah and Ward (2016) found that 63% of the studies found a positive influence between CSE and PU, and 80% of them found a positive influence between CSE and PEOU. In studies of developing countries, it was found that CSE influences PEOU of e-learning but does not affect PU (Boateng et al., 2016; Kanwal & Rehman, 2017; Ramírez Anormaliza et al., 2016). Ma et al. (2013) concluded that CSE does not influence the PU of e-learning systems.

6.2.3 Perceived Resources

Perceived resources (PR) refer to individuals' belief that they have the resources needed to use a given information technology (Mutambara & Bayaga, 2021; Venkatesh et al., 2003). In this study, the PR construct had five indicators (Appendix 1) but two of them (PR3 and PR4) were discarded during factor analysis because they had loadings of less than the 0.7 threshold (Garson, 2016). Each of these indicators had an average response of less than 3 (Appendix 3) from a five-point Likert scale ranging from 1 - strongly agree to 5 - strongly disagree. The average response rate of less than 3 means that PSTs agreed with all the indicators in the construct, implying that their decision to accept use of the MLMS was influenced by their belief that they have the resources needed to use the MLMS.

Two hypotheses anchored the PR construct: *pre-service teachers' perceived resources have a positive effect on perceived ease of use of the Moodle LMS (H5),* and that *pre-service teachers' perceived resources have a positive effect on behavioural intention to use the Moodle LMS (H6).* The empirical results from the model showed that both hypotheses *H5(β=0.347, p<0.05)*, and *H6(β=0.240, p<0.05)* were supported. This means that PSTs' PR have positive influence on their PEOU and their PU respectively. In the context of this study, the implication is that PSTs will decide to use the MLMS based on their perceptions of the ease of use of the technology and its usefulness.

The results for the PR construct were supported by Erlich et al. (2005), who found that students who were not familiar with using computers before enrolling for an online course reported more frustration and anxiety compared to those who were used to computers. Kunda et al. (2018) also found that the availability of resources, such as

wireless access points and access to computer equipment in classrooms and laboratories, positively affected users' decisions to accept ICTs in education. However, on the relationship between PR and PU, Ku (2009) concluded that the research data partially supports the hypothesis that PR has a positive effect on PU, thereby prompting further study on this relationship.

The general feeling from the current study though was that pre-service teachers who possess the relevant devices, financial resources, internet connection, and the required skills for online learning are most likely to be psychologically ready to use the Moodle LMS.

6.2.4 Perceived Ease of Use

Perceived ease of use (PEOU) refers to the extent to which users believe that using a given information technology would be free from effort (Davis, 1989; Mutambara & Bayaga, 2020a). In this study, the PEOU construct had five indicators (Appendix 1), but two (PEOU1 and PEOU5) were discarded during factor analysis because they had loadings of less than the 0.7 threshold (Garson, 2016). Each of these indicators had an average response rate of less than 3 (Appendix 3) from a five-point Likert scale ranging from 1 - strongly agree to 5 - strongly disagree. The average response of less than 3 means that PSTs agreed with all the indicators in the construct, implying that their decision to accept the use of the MLMS was influenced by their belief that the use of the MLMS would be free from effort.

Three hypotheses gave direction on this construct: *(1) pre-service teachers' perceived ease of use has a positive effect on perceived usefulness of the Moodle LMS (H8), (2) pre-service teachers' perceived ease of use has a positive effect on their attitude towards the use of the Moodle LMS (H9),* and that (3) *pre-service teachers' perceived ease of use has a positive effect on behavioural intention to use the Moodle LMS (H10).* The results from the proposed SARUTAM model showed that, while hypothesis *H8 (β=0.115, p>0.05)* was not supported, *H9 (β=0.238, p<0.05)* and *H10 (β=0.286, p<0.05)* were supported. These results imply that there is no positive relationship between PEOU and PU, but that there is a positive relationship between PEOU and ATT and between PEOU and BI. The implication is that PEOU does not influence PU, but does influence BI and AU of the MLMS.

The results are consistent with what was revealed in the literature. Teo and Milutinovic (2015) and Sivo et al. (2018) reported that PEOU had a significant effect on PU, while Saroia and Gao (2019) reported that the relationship was not significant. (Mutambara & Bayaga, 2020a) found no relationship between these variables, but in a different study with different participants altogether, Mutambara and Bayaga (2021) reported a very strong relationship between these variables. On the other two variables, PEOU was found to have a positive impact on a user's attitude towards use when using an information system, as well as on their behavioural intention (Binyamin et al., 2018; Mutambara & Bayaga, 2020a).

6.2.5 Perceived Usefulness

Perceived usefulness refers to the belief that the use of a given information technology can improve performance (Davis, 1989; Sivo et al., 2018). In this study, the PU construct had five indicators (Appendix 1), but two (PU4 and PU5) were discarded during factor analysis because they had loadings of less than the 0.7 threshold (Garson, 2016).

Each of these indicators had an average response rate of less than 3 (Appendix 3) from a five-point Likert scale ranging from 1 - strongly agree to 5 - strongly disagree. The average response of less than 3 means that PSTs agreed with all the indicators in the construct, implying that their decision to accept the use of the MLMS was influenced by their belief that the use of the MLMS could improve their performance.

The two hypotheses of this construct were that *pre-service teachers' perceived usefulness positively affects their attitude towards using the Moodle LMS (H11)* and that *pre-service teachers' perceived usefulness has a positive effect on their behavioural intention to use the Moodle LMS (H12).* The results indicated that both hypotheses *H11 (β=0.128, $p<0.05$)* and *H12 (β=0.091, $p<0.05$)* were supported by the data. This means that PU positively impacted both ATT and BI, implying that PSTs' behavioural intentions to use the MLMS are positively influenced by their perceived usefulness of the resource.

The results of hypotheses H11 and H12 are in agreement with those of Šumak et al. (2011), who found that there was a positive effect between PU and BI. Lee (2010) also found that PU has a positive effect on ATT. However, there are some contradictions in the body of knowledge on the effect of PU on both BI and ATT towards the

acceptance of information technologies. Saroia and Gao (2019) found that PU influences both ATT and BI to use an information system. In contrast, Teo and Milutinovic (2015) reported that it only influences ATT but not BI.

6.2.6 Attitude Towards Use

Attitude (ATT) towards the use of a given technology was defined by Fang et al. (2019) as the user's feelings and views towards that technology. In this study, the ATT construct had four indicators (Appendix 1), all accepted during factor analysis with loadings greater than the 0.7 threshold (Garson, 2016). Each of these indicators had an average response of less than 3 (Appendix 3) from a five-point Likert scale ranging from 1 – strongly agree to 5 – strongly disagree. The average response rate of less than 3 means that PSTs agreed with all the indicators in the construct, implying that their decision to accept the use of the MLMS was influenced by their feelings and views towards the use of the MLMS.

The construct was anchored by one hypothesis *pre-service teachers' attitude towards the MLMS will have a positive effect on their intention to use the Moodle LMS (H13).* The hypothesis *H3 (β=0.587, $p<0.05$)* was supported by the data. This means that PSTs' attitude has an influence over their behavioural intentions to use the MLMS. This implies that pre-service teachers in this study feel good about their actual use of the MLMS, such that they feel pleasant when using it.

Similar findings were also expressed by Mutambara and Bayaga (2020a) who found that thoughts and feelings (ATT) play a very important part in the acceptance of a given information system. Liu et al. (2009) and Lee et al. (2005) also, and separately, found that ATT directly influences BI. This shows that the results of this study on this attitude aspect are consistent with other studies. This justifies the inclusion of this construct in this study as a factor that determines pre-service teachers' acceptance of the MLMS, among others.

6.2.7 Behavioural Intention to Use

Behavioural intention (BI) refers to a person's cognitive readiness to perform a given behaviour and it is assumed to be an immediate antecedent of behaviour (Fang et al., 2019). BI was determined to be very integral in this study since pre-service teachers'

behavioural intentions to use the MLMS were a precursor of the actual use (AU), and, hence, their acceptance of the technology.

In this study, the BI construct had four indicators (Appendix 1), all accepted during factor analysis with loadings all greater than the 0.7 threshold (Garson, 2016). Each of these indicators had an average response rate of less than 3 (Appendix 3) from a five-point Likert scale ranging from 1 - strongly agree to 5 - strongly disagree. The average response rate of less than 3 means that PSTs agreed with all the indicators in the construct, implying that their decision to accept the use of the MLMS was greatly influenced by their behavioural intentions to use the MLMS.

For this study, only one hypothesis was proposed: *pre-service teachers' behavioural intention has a positive effect on their actual use of Moodle LMS (H14).* Empirical evidence supported hypothesis *H14 (β=0.707, $p<0.05$)*. This means that PSTs' behavioural intentions to use the MLMS indeed influenced their actual use of the resource.

The result of hypothesis H14 was consistent with that of (Kim & Lee, 2020), who reported that BI was considered the most significant determinant of a person's behaviour that directly affects the use of information technology. Šumak et al. (2011) also confirmed that BI was a major determinant of the actual use of an information system in various fields of study. The same outcome was also emphasised by (Graham et al., 2020; Sivo et al., 2018; Zarafshani et al., 2020), whose studies supported that users' behavioural intention to information technologies in education influences their actual usage. Hence, pre-service teachers' behavioural intention to use the MLMS in this study, has a positive effect on their actual use of the resource.

6.2.8 Actual Use

In this study, actual use (AU) of the MLMS refers to when pre-service teachers were exposed to the software and allowed to interact with it during active and passive learning. In the SARUTAM model AU is at the focal point, directly after BI. This makes it the final point of reference in the measure of pre-service teachers' acceptance of the MLMS. In this study, the AU construct had four indicators (Appendix 1), all accepted during factor analysis with loadings greater than the 0.7 threshold (Garson, 2016). Each of these indicators had an average response of less than 3 (Appendix 3) from a five-point Likert scale ranging from 1 - strongly agree to 5 - strongly disagree. The

average response of less than 3 means that PSTs agreed with all the indicators in the construct, implying their acceptance to use the MLMS.

The construct had three hypotheses: *pre-service teachers' actual use of the Moodle LMS has a positive effect on their continued use of the Moodle LMS (H15), pre-service teachers' actual use of the Moodle LMS has a positive effect on their confidence in using the Moodle LMS (H16),* and that *pre-service teachers' actual use of the Moodle LMS has a positive effect on their preparedness to use the Moodle LMS (H17).* All these three hypotheses, *H15 (β=0. 544, p<0.05)*, *H16 (β=0.557, p<0.05)*, and *H17 (β=0.595, p<0.05),* were supported, resulting in a moderate total explained variance of 48.9% at AU. This means that the factors identified in this model explained the usage of PSTs' acceptance of the MLMS very well.

The results were consistent with those of Davis et al. (1989), who found a very strong usage correlation coefficient of 0.63. Hernandez et al. (2011) also found that the usage of ICT had a moderate 45.6% explanatory power, meaning that the factors captured in their model to predict usage explained it very well.

6.2.9 Acceptance of the MLMS

The level of acceptance of the MLMS in this study was determined by the magnitude of the BI and AU variables, which were explained by the external and TAM variables detailed in sections 6.2.1 to 6.2.8. Partial least squares structural equation modelling was used to evaluate the proposed SARUTAM model hypotheses. Consequently, the acceptance of the MLMS by pre-service teachers in this study was evaluated using the R-squared value (variance explained); structural paths (path coefficients); effect size (f-squared); and predictive relevance (Q-squared) of the model. Since the aim was to find and examine the factors that predict PSTs' acceptance of the MLMS, only the significant paths of the developed model were discussed. The rejected paths were discarded because they would not help in the prediction of relevant factors affecting PSTs' acceptance of the MLMS.

The results explained in sections 6.2.1 to 6.2.8 and in Figure 5.4 indicated that the proposed model adequately explained the variance in pre-service teachers' acceptance of the MLMS. The combined variance generated by the six variables (SN, CSE, PR, PEOU, PU, and ATT) was 69.9% at BI and 48.9% at AU. These were moderate and respectable R-squared values (Chin, 1998). These results imply that

variables identified in the model adequately explained PSTs' acceptance of the MLMS. Hence, the identified factors were good predictors of pre-service teachers' acceptance of the MLMS. The q-squared values of the endogenous variables PEOU, PU, ATT, BI, and AU were 0.363, 0.367, 0.314, 0.394, and 0.247, respectively, and all greater than zero. This means that the model has predictive relevance (Garson, 2016; Hair et al., 2017). This implies that the predictors SN, CSE, PR, PEOU, PU, and ATT can comfortably predict pre-service teachers' acceptance of the MLMS.

The f-squared values of SN, CSE, PR, PEOU, PU, and ATT on BI as well as that of BI on AU were all positive and real (Chin, 1998). This means that each one of these constructs contributed to the explained variance of AU. The implication is that each one of these constructs had a positive influence on pre-service teachers' acceptance of the MLMS.

The results shown in section 5.6 show the total indirect effects of each of the six variables that explain the acceptance of pre-service teachers' acceptance of the MLMS. The calculated mediation results rank the total indirect effects of each variable. The variable with the most effect on AU was PR (0.476). This result means that a unit increase in PR results in a 0.476 increase in AU. The next was PU (0.137), followed by SN (0.103), PEOU (0.073), ATT (0.057), and then CSE (0.012), respectively, all resulting in positive increases in the actual use of the MLMS resource.

The purpose of objective 1 was to examine factors that predict pre-service teachers' acceptance of the MLMS. All three external variables SN, CSE, and PR, together with the three endogenous TAM variables PEOU, PU, and ATT, combined to explain the variance in BI at a moderate value of 66.9%, which in turn explained a respectable 48.9% variance in actual use (AU) of the MLMS.

While all seven factors were retained, three hypotheses *H1 (β= -0.092, p>0.05)*, *H2 (β= -0.134, p>0.05)*, and *H8 (β=0.115, p>0.05)*, were rejected (see sections 6.2.1 and 6.2.4). Figure 6.1 summarises the findings of objective 1.

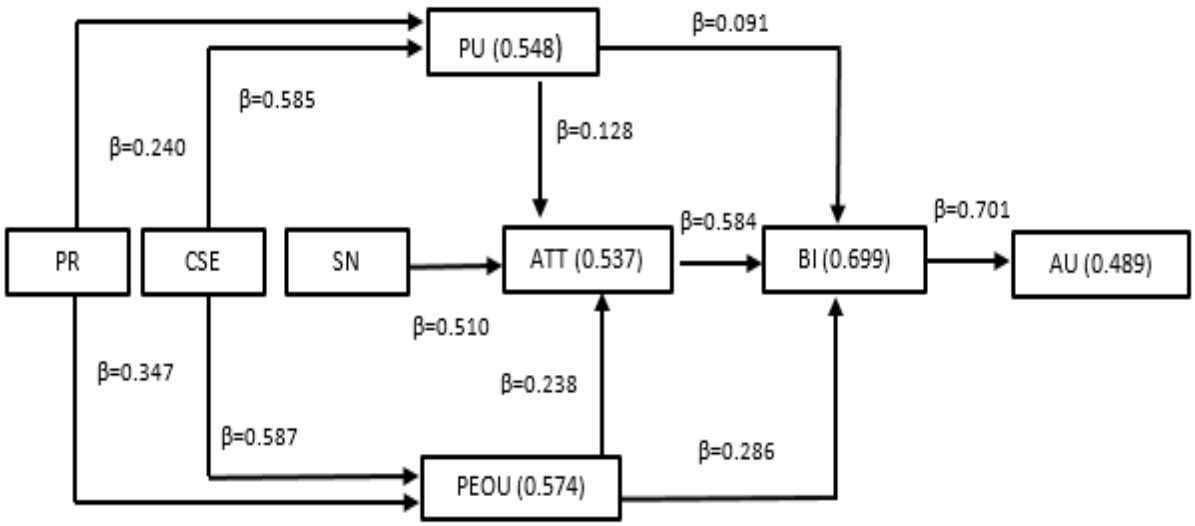

Figure 6.1: Factors predicting PSTs' acceptance of the MLMS

6.3 Extent of Pre-Service Teachers' Confidence in Using the MLMS.

In section 6.2, the intention was to examine factors that predict pre-service teachers' acceptance of the MLMS. The factors were established and summarised in Figure 6.1. The extent of the intention was established by the acceptance of hypotheses H10, H12, and H13, that loaded a total explained variance of 66.9% in pre-service teachers' behavioural intention to use the MLMS. The combined effect of the identified variables in the SARUTAM model explained 48.9% of the variance in actual use of the MLMS. Having established the extent of the actual use in objective 1, objective 2 intended to investigate the extent of pre-service teachers' confidence in using the MLMS. This was achieved by examining the effect of pre-service teachers' actual use (AU) of the MLMS on their confidence (CON) in using it.

This study used the construct confidence (CON) to assess whether pre-service teachers were confident in using the Moodle LMS as they continued to work on their studies. In this study, the CON construct had nine indicators (Appendix 1), but five of them (CON1, CON2, CON5. CON6, and CON8) were discarded during factor analysis because they had loadings of less than the 0.7 threshold (Garson, 2016). However, this did not impact on the validity and reliability of the construct because the recommended number of indicators is 3 (Hair Jr et al., 2014), while Garson (2016) recommended that even one indicator suffices.

Each of these indicators had an average response of less than 3 (Appendix 3) from a five-point Likert scale ranging from 1 - strongly agree to 5 - strongly disagree. The average response of less than 3 means that the PSTs agreed with all the indicators in the construct, implying that their confidence influenced their decision for the continued use of the MLMS.

The hypothesis of interest in this construct was that *pre-service teachers' actual use of the Moodle LMS positively affects their confidence in using the Moodle LMS (H16).* The data supported hypothesis *H16 (β=0.557, $p<0.05$)*, implying that a unit increase in pre-service teachers' actual use of the MLMS increases their confidence in using the resource by 0.557 units. Actual use of the resource also explained 30.7% of the variance in pre-service teachers' confidence in using it. This coefficient of determination is relatively low but hugely close to moderate (Chin, 1998; Höck & Ringle, 2006).

The result was consistent with that of Reisoğlu and Çebi (2020), who reported that pre-service teachers' self-confidence in using technology increased with the help of applications used in the training. Sadaf et al. (2012) found that pre-service teachers reported moderate confidence for using Web 2.0 technologies. List (2019) shared the same sentiments by reporting that students express a great deal of confidence in their own digital literacy. In an investigation to identify the opportunities and challenges of using e-learning in Zimbabwe (a developing country like South Africa), Chitanana et al. (2008) reported that a significant number of users lacked confidence in the use of e-learning platforms.

It can be seen that different researchers on confidence in using technology produced different results: some in support and some at variance. This could explain the weak coefficient of determination (30.7%) found in the current research. Nevertheless, there is encouragement that confidence is developing in this rural community's pre-service teachers to use the MLMS. This is a welcome development, given that most learning activities are moving online due to the ongoing social distancing caused by the Covid-19 pandemic.

Objective 2 intended to investigate the extent of pre-service teachers' confidence in using the MLMS. The results showed that the hypothesis was supported and that actual use of the resource increased PSTs' confidence in the resource. It was also

demonstrated that the SARUTAM model explained a close to moderate variance of 30.7%. These results are summarised in Figure 6.2

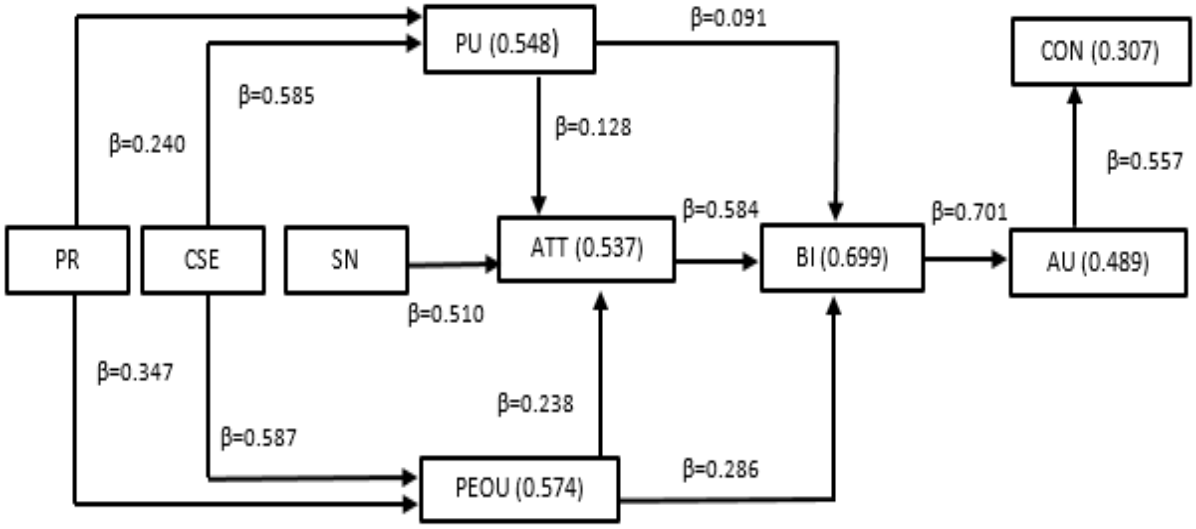

Figure 6.2: Extent of PSTs' confidence in using the MLMS

6.4 Determination of Pre-Service Teachers' Preparedness to Use the MLMS

Having established the extent of actual use (AU) of the MLMS in objective 1, read together with explanations in paragraph 1 of section 6.3, objective 3 intended to determine pre-service teachers' preparedness to use the MLMS. This was achieved by examining the effect of pre-service teachers' actual use (AU) of the MLMS on their preparedness (PPD) in using it.

Preparedness (PPD) is the state or condition of being ready. It emphasises the attitudinal aspect of being prepared to do something (Gill & Dalgarno, 2008), in this case, if ready to use the MLMS. The construct was included in this study to ascertain whether pre-service teachers were prepared to continue using the Moodle LMS, after its acceptance (see section 6.2).

The PPD construct had nine indicators (Appendix 1), of which six of them (PPD2, PPD3, PPD4, PPD5. PPD6, and PPD7) were discarded during factor analysis because they had loadings of less than the 0.7 threshold (Garson, 2016). This did not impact on the validity and reliability of the construct for the reasons already explained in section 6.3. Each of these indicators had an average response of less than 3 (Appendix 3) from a five-point Likert scale ranging from 1 - strongly agree to 5 -

strongly disagree. The average response of less than 3 means that PSTs agreed with all the indicators in the construct, implying that their decision for the continued use of the MLMS was influenced by their preparedness to use the MLMS.

The hypothesis of interest in this construct was that *pre-service teachers' actual use of the Moodle LMS positively affects their preparedness to use the Moodle LMS (H17).* Hypothesis *H17 (β=0.595, p<0.05)* was supported by the data, implying that a unit increase in pre-service teachers' actual use of the MLMS increases their preparedness to use the resource by 0.595 units. Actual use of the resource also explained 35.2% of the variance in pre-service teachers' preparedness to use the resource. This coefficient of determination was moderate (Chin, 1998; Höck & Ringle, 2006).

This result was consistent with the findings of Gill and Dalgarno (2008), who reported a high level of pre-service teachers' preparedness to use ICTs in the classroom. In a separate study to determine the influence of preparedness on online students' feelings of anxiety, Abdous (2019) reported that students expressed a high level of preparedness to take online courses. However, Chitanana et al. (2008) reported that 47% of users in their study expressed some doubt on their level of preparedness to use the e-learning platforms available at their universities.

The results, once again, showed mixed reactions by participants of different studies (Abdous, 2019; Chitanana et al., 2008; Gill & Dalgarno, 2008). Some expressed some level of preparedness to use the available technologies, while others were not sure if they were prepared enough. The moderate 35.2% variance obtained at PPD showed that users from these deep rural communities were at least moving in the right direction in embracing the use of the MLMS.

Objective 3 intended to determine pre-service teachers' preparedness to use the MLMS. The results showed that the hypothesis was supported and that actual use of the resource increased PSTs' preparedness to use the resource. It was also demonstrated that the SARUTAM model explained a moderate variance of 35.2%. The results of objective 3 are summarised in Figure 6.3.

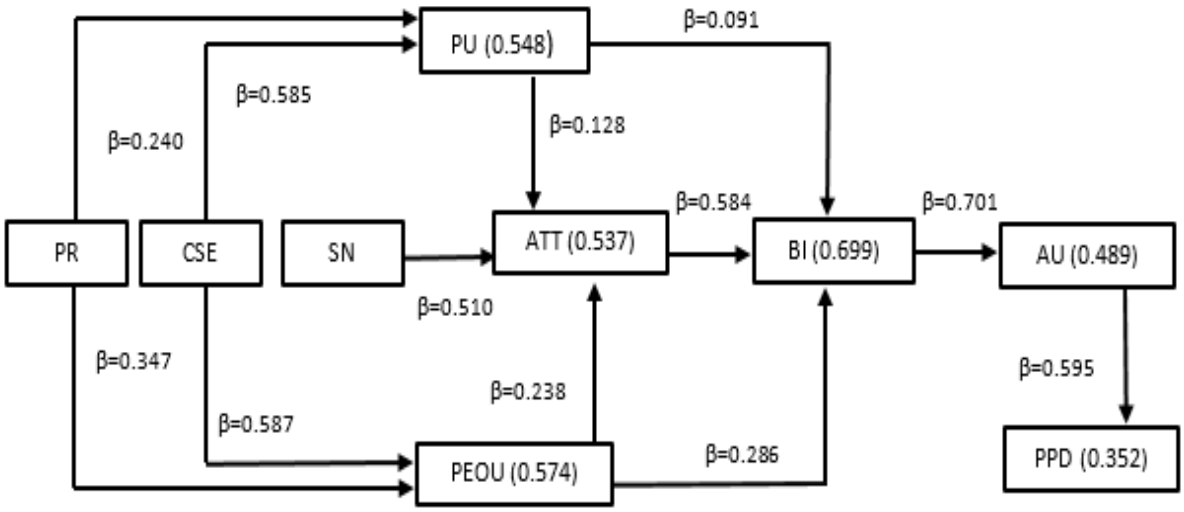

Figure 6.3: Determination of PSTs' preparedness to use the MLMS

6.5 Magnitude of Pre-Service Teachers' Continued Use of the MLMS

The purpose of objective 4 was to establish the magnitude of pre-service teachers' continued use (CU) of the MLMS. The CU construct was conceived as an extension of the TAM to establish the extent of PSTs' continued use of the MLMS as a resource. As seen in section 6.2.8, actual use (AU) was the focal point of the TAM whose constructs explained 48.9% of the variance in AC. In this objective, actual use (AU), confidence (CON) in using the MLMS, and preparedness (PPD) to use the MLMS combined to explain the extent of CU of the MLMS.

In this study, three hypotheses were formulated concerning the AC of the Moodle LMS. Firstly, it was hypothesised that *pre-service actual use of the Moodle LMS has a positive effect on their continued use of the Moodle LMS* (*H15).* Based on the empirical results of the study *(β=0.544, p<0.05)*, this hypothesis was accepted. Secondly, it was hypothesized that pre-service teachers' CON in using the MLMS positively affects *continued use of the resource (*H16). The results showed that this was also true *(β=0.557, p<0.05),* and the hypothesis was accepted. Thirdly, pre-service *teachers' PPD positively affects the continued use of the Moodle LMS (*H17). Once again, the results (β=0.595, p<0.05) showed that the postulate was true. Hence, the hypothesis was upheld. Therefore, it was concluded that AU positively affected all three of CON, PPD, and CU. This means that AU, a focal construct of the TAM, positively influences the extended TAM that seeks to explain PSTs' continued use of the MLMS.

The other two constructs designed to explain CU in this study were CON and PPD. It was hypothesised that pre-service *teachers' confidence in using the MLMS has a positive effect on continued use of the resource* (H18) and that *pre-service teachers' preparedness to use the Moodle LMS has a positive effect on their continued use of the resource* (H19). Computations of empirical data accepted *H19 (β=0.373, p<0.05)*, that indeed pre-service teachers' PPD has a positive effect on CU, but hypothesis H18 *(β= -0.06, p>0.05)* was rejected, implying that pre-service teachers' CON does not influence their CU. This means that an increase in pre-service teachers' confidence in using the MLMS does not necessarily result in the increased *continued use* of the resource. This was an unanticipated result because the expectation was that increased confidence in pre-service teachers' use of the MLMS would result in increased continued use.

This result is consistent, though, with that of Chitanana et al. (2008). They reported that a significant number of users in a rural university in Zimbabwe lacked confidence in the use of e-learning platforms. On the contrary, Hajjar (2015) reported that 100% of the faculty members expressed self-confidence in their skill to use Moodle and that the majority of the students (75%) had shown significant confidence in their capability to use Moodle.

As noted earlier, the three factors AU, CON, and PPD combined determine the magnitude of the impact on continued use of the MLMS. The impact of the TAM variables was indirectly transferred to CU through the TAM focal variable AU, as shown in Figures 5.8 and 6.4. In turn, AU alone explained 30.7% of the variance in CON and 35.2% of the variance in PPD. Finally, the three variables AU, CON, and PPD together, directly and/or indirectly, explained a total variance of 66.5% in CU. According to Chin (1998), this amount of variance was substantial. This means that most of the variance in CU was explained by variables identified in the model.

The remaining variance of only 33.5% of the variance in CU is explained by variables not captured in this model. Such factors that are not currently known can be the basis for further investigation in another study. The explained r-squared value of 66.5% means that the model is a good predictor of the factors that affect pre-service teachers' continued use of the MLMS.

At this stage, there is a need for the researcher to stress that extending the TAM from actual use to continued use is a fairly new phenomenon. Most models end at either behavioural intention to use or at actual use (Davis et al., 1989; Mutambara & Bayaga, 2021; Venkatesh & Davis, 1996). In a conceptual paper, Al Amoush and Sandhu (2018) included continued use as the focal construct after acceptance of the LMS. Still, there was no empirical data to support their conceptualisation. They recommended that further research with empirical data be done to justify its inclusion in the model (see section 2.10, Figure 2.7).

The empirical results of this study are not entirely foreign, though. In an attempt to identify social motivations that underlie learners' attitudes and usage behaviour of ICT interactive tools, Hernandez et al. (2011) discovered that 46.7% of continuance intentions were explained by the factors identified in their model. They concluded that continuance intentions were inherent if use conditions permitted.

In another study, Wu and Zhang (2014) investigated continuance intentions towards E-Learning 2.0 in organisational contexts after observing that E-Learning 2.0 plays a significant role in training and development within organisational environments after an initial acceptance, but its use is frequently discontinued. They concluded that continuance intentions were present, as shown in their results that 52% of continuance intention was explained by the factors identified in their model.

In this study, there is a need to note that the studies by Hernandez et al. (2011) and Wu and Zhang (2014) focused on continuance intentions instead of continued use. Therefore, the current researcher believes that this study has taken the work of Al Amoush and Sandhu (2018) further by providing an empirical dimension to the extension of the TAM from actual use to continued use. Figure 6.4 summarises the results of this objective.

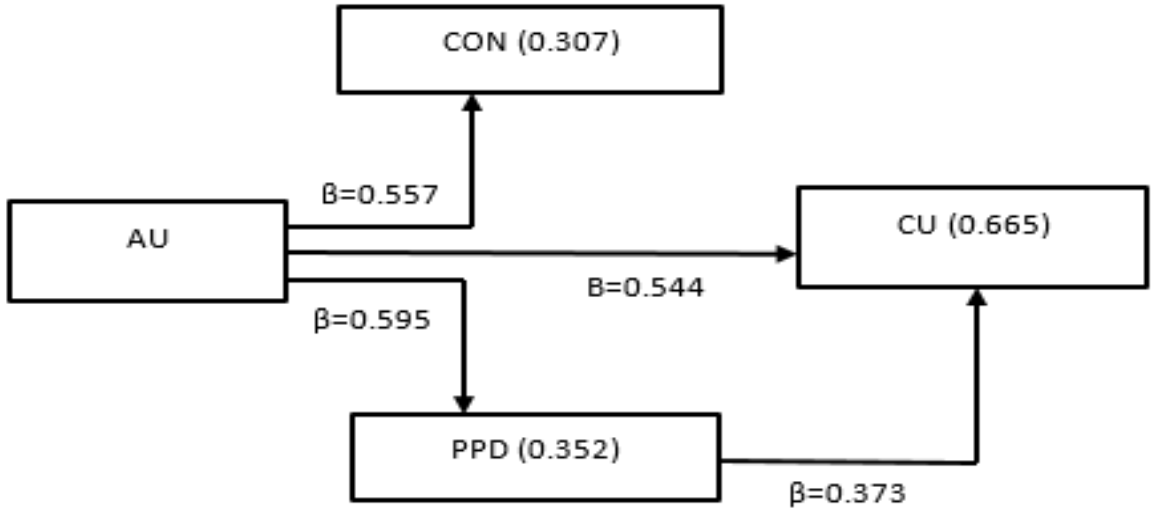

Figure 6.4: Magnitude of PSTs' continued use of the MLMS

6.6 Role Played by Demographics in PSTs' Acceptance of the MLMS

In this study, moderation was used to examine the role played by demographics in PSTs' continued use of the MLMS. The aim was to establish whether demographic factors indeed influence the relationships between continued use of the MLMS and the factors perceived to influence it. The three demographic factors considered in this study were respondents' age, level of study, and gender.

The results in Figure 6.4 show that four postulates had negative β_s, while the remaining five were positive. The negative β_s imply the effect of change of direction of the relationship between variables. In contrast, the positive ones imply the effect of change of strength in the variable relationships (Hair Jr et al., 2016). However, all their *t*-values were less than 1.96, and their *p*-values were greater than 0.05, thereby failing to uphold the postulates. This means that all the nine postulates emanating from the three demographic variables moderating relationships among the four constructs AU, CON, PPD, and CU, were rejected at a 5% level of significance, thereby concluding that demographic variables identified in this study do not moderate relationships among the identified constructs.

These findings imply that the demographic variables age, level of study, and gender do not influence pre-service teachers' continued use of the learning management system in question. The findings of this study are consistent with those by Evans (2013), who found that age and gender do not moderate relationships of variables that

affect students' behavioural intentions to use e-learning resources. Papadakis (2018) also found no gender and age difference regarding the purpose of using smart mobile devices. However, the results are contradictory to those of Assaker (2020), who found that age and gender variables do moderate online usage.

In this research, the construct level of study which other authors call education level (Aliyu et al., 2019), was rejected as a moderator of the relationships among constructs in the current study. However, this result was inconsistent with the findings of Claar et al. (2014) in a study on student acceptance of learning management systems. They hypothesised that education level would significantly influence PU and PEOU. Both of these hypotheses were supported, and they concluded that education level had a significant influence on students' acceptance of LMSs. In support, Aliyu et al. (2019) also established that the level of study of business students moderates their intention and use behaviour.

6.7 Chapter Summary

This study aimed to examine pre-service teachers' acceptance, confidence, and preparedness to use learning management systems in the context of a South African rural university**.** This chapter discussed the significance of the findings of the relationships proposed in the SARUTAM conceptual model. The introductory section of the chapter was presented, followed by a discussion of the factors that predict pre-service teachers' acceptance of the MLMS. Seven factors were identified and analysed. Of the thirteen associated hypotheses, only three were not supported.

Next, the extent of pre-service teachers' confidence in using the MLMS was discussed, and it was concluded that the pre-service teachers' confidence in using the MLMS was gaining momentum. It was also shown that pre-service teachers' preparedness to use the MLMS was growing. The magnitude of pre-service teachers' continued use of the MLMS was also found to be overwhelming. The role played by demographics in pre-service teachers' acceptance of the MLMS was found to be non-existent.

CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

This study aimed to examine pre-service teachers' acceptance and continued use of the Moodle learning management system in the context of a South African rural university. The previous chapter discussed the results and findings of the relationships proposed in the SARUTAM conceptual model. The extent to which these findings agree with previous studies discussed in this study's literature review was also discussed. This chapter now summarises the current research and contributions, as well as the implications, conclusions, and recommendations for future research on the central theme explored in this thesis.

7.2 Summary of the Study

The study was divided into seven chapters. Chapter One presented the background to the study in which the problem to be investigated was explained. To this end, five research questions and five objectives of the study are presented in this chapter, as well as the significance of the study and possible contributions.

A detailed review of the literature and past studies related to the acceptance and continued use of learning management systems were presented in Chapter Two. Different types of learning management systems, as well as their features, were explored. The learning management system used at the site where the study was carried out, Moodle, was explained in detail, including its advantages and disadvantages. The factors affecting the use of Moodle locally and internationally were explored and presented.

Theoretical underpinnings and the study's conceptual framework were presented in Chapter Three. This study used the technology acceptance model, whose flexibility allowed the researcher to include features that specifically addressed the needs of the participants in their natural rural habitats. Justification for the new constructs was provided. The hypotheses of the conceptual model were explained in detail in this chapter.

The methodology used in the thesis and the researcher's philosophical position were described in detail in Chapter Four. The analysis lenses used in this thesis, partial least squares structural equation modelling, were also presented in this chapter. A detailed presentation on how the data were analysed, starting from the measurement model through to the structural model, including moderation, was given in this chapter.

In Chapter Five, the results of this study were presented. A discussion and analysis of the results were presented in Chapter Six. Other scholars in the literature who conducted similar research elsewhere in the country and beyond were detailed. The summary of the research and contributions, implications, conclusions, and recommendations for further studies on the central theme explored in this thesis are given in this Chapter Seven.

7.3 Contributions of the Study

This study aimed to examine pre-service teachers' acceptance, confidence, and preparedness to use learning management systems in the context of a South African rural university. Significant contributions to the body of knowledge were made. These can be divided into theoretical contributions and practical contributions.

7.3.1 Theoretical Contributions

The study proposed and empirically tested the South African rural universities technology acceptance model (the SARUTAM), thereby contributing to theory building and to the ongoing debate on the acceptance of technology in higher education contexts. The contribution is even more significant for institutions in rural communities where access to computer technology is limited. The insights on causal relationships among the added external factors to the TAM were explored and validated. Contributions of the SARUTAM to the body of knowledge are detailed herewith.

Contribution 1: The study developed and empirically tested a unique and comprehensive three-tier technology acceptance model (the SARUTAM) used to examine pre-service teachers' acceptance and continued use of learning management systems in the context of a South African rural university. The three phases of the model were (1) external variables, (2) original TAM variables, and (3) continued use variables. This model was unique in the sense that it extended the TAM

in both directions, unlike in traditional cases where external factors only extended the TAM *a priori*. In this study, the TAM was also extended *a posteriori*, which is a first in its own right.

Contribution 2: The original TAM was extended by pre-adding three external variables that were perceived to impact pre-service teachers' acceptance of the Moodle learning management system at this rural institution. These variables were subjective norms (SN), computer self-efficacy (CSE), and perceived resources (PR). The study revealed that these context-related external variables added much-needed stability to the original TAM by explaining more than 54.8% of the variance in perceived usefulness and 57.4% of the variance in perceived ease of use.

The level of explanatory power provided by the identified external variables into the TAM helped develop other conceptual frameworks for exploring technology acceptance and adoption in higher education contexts of poor rural backgrounds. This means that context-related external variables can be used to improve the predictive power of the original TAM.

Contribution 3: The original TAM was also extended by post-adding three extra variables that were perceived to impact pre-service teachers' continued use of the Moodle learning management system at the rural institution under study. These three variables were confidence in using (CON), preparedness to use (PPD), and continued use (CU) of the Moodle LMS. The results showed that the identified variables of the study explained 66.5% of the variance in continued use (CU) of the Moodle learning management system. This excellent model performance implies that pre-service teachers of this rural institution were willing to continue using the resource, *ceteri paribus*.

Contribution 4: The findings of the study revealed that perceived resources (PR) was the most influential predictor of pre-service teachers' acceptance of the Moodle learning management system at this rural institution. It was followed by perceived use (PU), subjective norms (SN), perceived ease of use (PEOU), attitude (ATT), and then computer self-efficacy (CSE), respectively. This implies that if authorities need to have greater pre-service teachers' acceptance of the Moodle learning management system, they need to supply more ICT resources first and then work on influencing pre-service teachers' perceived use of the resource next until they get to the last ranked factor,

computer self-efficacy. This finding is a critical policy component for policymakers in institutions of higher learning located in poor rural communities with limited ICT infrastructure and resources.

7.3.2 Practical Contributions

In practice, this research has also helped stakeholders to understand better the factors that affect pre-service teachers' acceptance, confidence, and preparedness to use learning management systems in the context of rural universities. University authorities can now make informed decisions to increase users' participation with technology systems. The same applies to learning management systems programme developers, lecturing staff, and the students themselves. The practical contributions given herewith apply, in particular, to developing countries whose social and economic conditions in their institutions are similar to those of the institution examined in this study.

Contribution 5: In this study, the external variables (perceived resources, subjective norms, and computer self-efficacy) chosen to augment the original TAM were critical and relevant to the conditions of the examined institution. Together they contributed immensely to the TAM (54.8% of the variance at PU and 57.4% at PEOU). The perceived resources construct was found to bear the most significant influence on pre-service teachers' acceptance of the LMS. This finding is beneficial to stakeholders when they plan to use and implement LMS at their institutions. Institution authorities should prepare for increased ICT infrastructure to enable end-users to access and use the technology. Such infrastructure could include more internet bandwidth, Wi-Fi, and offline portals for remote institutions. The supply of computers, laptops, tablets, smartphones, and other devices that can be used to access the internet should be increased to and by both lecturers and students. This is especially the case in institutions of developing countries.

Contribution 6: The study ranked subjective norm (SN) as the third most influential factor that affects pre-service teachers' acceptance of the learning management system. This social influence factor is significant in the sense that users of the system choose to use it or not, depending on the opinions of a significant other. Understanding this factor is key to university authorities to develop awareness programmes that

positively change people's views about learning management systems and online learning. This could lead to the successful adoption and implementation of LMS.

Contribution 7: This study was the first of its kind to investigate factors that influence pre-service teachers' acceptance, confidence, and preparedness to use learning management systems in the context of a rural based institution. The identified factors point users in rural communities in the right direction, particularly in terms of what factors they should focus on so as to be active participants in cyberspace. Being a cyberspace citizen is now increasingly important because most activities have now moved online due to the negative effects of the Covid-19 pandemic. People are now encouraged to maintain social distancing and often avoid crowded areas. Such crowded areas could include learning spaces at institutions of higher learning. Most learning has now moved online. Hence, pre-service teachers and other users of online services, including users of learning management systems, need to be well informed and participate online.

Contribution 8: This study developed a modern and robust technology acceptance model for the acceptance, confidence, and preparedness to continue using learning management systems using constructs critical to local rural communities. This should give confidence to future researchers to explore possibilities for improving their communities using locally designed technology models that suit the needs of their communities. This way, more of the intended end-users will have a chance to reach their potential, irrespective of their location, urban or rural.

Contribution 9: The results showed that all three demographic variables of this study do not moderate the continued use of learning management systems. This was a surprising result which contradicted other researchers' findings (see section 6.6). The result may point to the fact that dynamism in demographics due to changing living conditions in different communities may reduce (or even erase) differences in acceptance previously associated with these demographics. For instance, in the past, there was little electricity supply in rural communities. If available, it would be unaffordable for rural people's meagre incomes. These days, all eligible poor community members in South Africa receive a grant to help them sustain life.

7.4 Limitations of the Study

Similar to any other research, this study had its limitations. They need to be considered:

- The researcher chose the constructs and indicators of this study in consultation with various stakeholders at the institution where the study took place. Though great care was taken to include all the critical variables identified, some important constructs and indicators may still have been left out. This could have understated the extent of the influence of the model.
- The study was limited to a particular rural university. To get a clearer picture of the extent to which pre-service teachers use the learning management system, the study should have been extended to more rural institutions.
- The fact that the study focused on one rural university, generalisation of the findings to all rural universities should be made with caution.
- This study considered only pre-service teachers as participants, excluding other student users and their lecturers. Including all students could have added to the robustness of the developed model.
- This study followed a quantitative design. However, applying a qualitative method could reveal further details and deep personal opinions that could explain the relationships among constructs differently.

7.5 Conclusion

This study aimed to examine pre-service teachers' acceptance, confidence, and preparedness to use learning management systems in the context of a South African rural university. In line with set objectives, the following conclusions were established:

All the factors identified in the study positively influenced pre-service teachers' acceptance of the Moodle learning management system. This means that they were all important in predicting the acceptance of the MLMS.

The factor with the most significant effect on actual use of the MLMS was perceived resources (0.476), followed by perceived use (0.137), then subjective norm (0.103),

perceived ease of use (0.073), attitude (0.057), and computer self-efficacy (0.012), respectively.

On investigating the extent of pre-service teachers' confidence in using the Moodle learning management system, it was established that the actual use of the resource had a positive effect on pre-service teachers' confidence in using it, although the magnitude of the effect was not that big. The model's explained variance on the confidence in using variable was low at 30.7%. This means that pre-service teachers were not that confident in using the resource, though they were willing to.

On the determination of pre-service teachers' preparedness to use the Moodle learning management system, it was established that actual use of the resource increased pre-service teachers' preparedness to use it. The model's explained variance on pre-service teachers' preparedness to use the resource was moderate at 35.2%. This showed that users from these deep rural communities were at least moving in the right direction in embracing learning management systems.

About the magnitude of pre-service teachers' continued use of the Moodle learning management system, it was established that the identified variables of the proposed model were excellent predictors of continued use. The explained variance of continued use was an impressive 66.5%. This means that the model was an excellent predictor of pre-service teachers' continued usage of Moodle learning management system.

Lastly, the moderation results of the study were not supported. This means that demographic variables identified in the study did not influence pre-service teachers' continued use of the learning management system. This could be due to several reasons, as explained in section 7.3.2, contribution 9.

7.6 Recommendations

Research on technology acceptance and learning management systems have become topical, now more than ever, because of the need for the online learning forced onto humanity by the worldwide outbreak of the Covid-19 pandemic. This study has contributed to the body of knowledge by identifying and explaining factors that predict acceptance and continued use of learning management systems, as well as developing a technology acceptance model appropriate for rural institutions and their poor communities. However, more research is required to fully understand how rural

communities in developing countries can adapt to the use of technology in this rapidly changing world.

Some of the possible areas on which future researchers can focus may be:

- This study used a quantitative design and applied partial least squares structural equation modelling in its analysis. Future studies could use a qualitative design. A qualitative study could reveal further hidden details and participants' deep personal opinions that could explain the relationships among all constructs differently than those expounded in this study.
- The current study focused only on pre-service teachers of one rural university. Future studies could do a longitudinal study across more rural institutions, allowing all students across faculties using the learning management system to participate and validate the model developed in this study.
- It would also be interesting to see a similar study conducted in urban areas and then compare the two models to see any significant differences in their structure. It would be interesting to know if pre-service teachers' acceptance of learning management systems is affected by their residential location.
- The model developed in this study explained 66.5% of the variance in the continued use of the Moodle learning management system. This means that factors outside this model explain 33.5% of the variance. It would be interesting to see future studies focussing on finding these 'missing' factors.
- One of the findings of this study was that pre-service teachers' demographics do not moderate their continued use of the Moodle learning management system. It would be interesting for future studies in this area to find out why demographics were not accepted as moderators of continued use of this resource.

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APPENDICES

Appendix 1: Research Questionnaire

Topic: Pre-Service Teachers' Acceptance, Confidence and Preparedness to Use the Moodle Learning Management System

Purpose of the study

The purpose of this study is to examine factors that predict pre-service teachers' acceptance, confidence and preparedness to use the Moodle learning management system at UNIZULU. The data gathered from this survey will be used solely for this purpose. To aid the study, may you please answer the following questions. Participation in this survey is by choice, you can opt out any time you feel like doing so. Your individual responses to the survey will be strictly confidential. Just in case contact 0832160037.

Section A: Demographic data

(Please tick the appropriate box)

Gender

Male	Female
1	2

Your level of study

Level 1	Level 2	Level 3	Level 4	PGCE
1	2	3	4	5

Age

18 Years & below	19-20 Years	21-22 Years	23-24 Years	25 Years & above
1	2	3	4	5

Section B: Constructs and indicators

Please indicate your level of agreement with each of the following statements by placing an **X** in the appropriate box where 1 - strongly agree, 2 - agree, 3 - undecided, 4 - disagree, and 5 - strongly disagree

Code	Construct	1	2	3	4	5
	Your Confidence in using Moodle					
CON1	I am confident when using Moodle in class	1	2	3	4	5
CON2	I am confident when using Moodle tools for educational purposes	1	2	3	4	5
CON3	I am confident when using Moodle as an educational tool	1	2	3	4	5
CON4	I am confident when accessing a course on Moodle	1	2	3	4	5
CON5	I am confident in using the messaging tool on Moodle	1	2	3	4	5
CON6	I am confident when uploading files for assessment on Moodle	1	2	3	4	5
CON7	I am confident when downloading files from Moodle	1	2	3	4	5
CON8	I am confident when using the chat tool in Moodle	1	2	3	4	5
CON9	I am confident when using the forum tool on Moodle	1	2	3	4	5
	Your Preparedness to using Moodle (basic skills)					
PPD1	I can login to Moodle without assistance	1	2	3	4	5
PPD2	I am able to navigate through Moodle tools without assistance	1	2	3	4	5
PPD3	I can update my Moodle profile settings without assistance	1	2	3	4	5
PPD4	I am able to download my course grades from Moodle	1	2	3	4	5
PPD5	I am able to upload files for marking on Moodle	1	2	3	4	5
PPD6	I am able to participate in discussions on Moodle forums	1	2	3	4	5
PPD7	I am able to access feedback from lecturers on Moodle	1	2	3	4	5
PPD8	I am able to respond to quizzes on Moodle	1	2	3	4	5
PPD9	I am able to download materials from folders on Moodle	1	2	3	4	5
	Perceived usefulness of Moodle					
PU1	I find Moodle useful for learning	1	2	3	4	5
PU2	Using Moodle makes my learning more effective	1	2	3	4	5
PU3	Using Moodle helps me to improve my learning performance	1	2	3	4	5
PU4	Using Moodle enables me to accomplish tasks more quickly	1	2	3	4	5
PU5	Using Moodle enables me to score better grades in my coursework	1	2	3	4	5
	Perceived ease of use of Moodle					
PEOU1	Learning to use Moodle was easy for me	1	2	3	4	5
PEOU2	I found Moodle easy to use	1	2	3	4	5
PEOU3	It was easy to become skilful at using Moodle	1	2	3	4	5
PEOU4	My interaction with Moodle is clear and understandable	1	2	3	4	5
PEOU5	I find it easy to navigate through most of the Moodle tools	1	2	3	4	5
	Perceived Resources for the use of Moodle					
PR1	I have the resources I need to use Moodle	1	2	3	4	5
PR2	I have access to the resources I need to use Moodle	1	2	3	4	5
PR3	I am able to use Moodle any time I want	1	2	3	4	5
PR4	There are no barriers to my using Moodle in computer labs	1	2	3	4	5

PR5	I have Moodle installed on my laptop and smartphone	1	2	3	4	5
	Behavioural Intention to use of Moodle					
BI1	I intend to increase my use of Moodle in different learning activities	1	2	3	4	5
BI2	I see myself using Moodle for handling my university related work	1	2	3	4	5
BI3	I intend to use Moodle for my future studies	1	2	3	4	5
BI4	I would recommend using Moodle to others	1	2	3	4	5
	Actual use of Moodle					
AU1	I login to Moodle several times per week	1	2	3	4	5
AU2	On average I spend more than an hour each time I login to Moodle	1	2	3	4	5
AU3	I use Moodle to access my notes	1	2	3	4	5
AU4	I use Moodle for assessments	1	2	3	4	5
	Continued use of Moodle					
CU1	I depend on Moodle for most of my academic work	1	2	3	4	5
CU2	I would like to use Moodle in all my modules	1	2	3	4	5
CU3	I will continue using Moodle until I finish my studies	1	2	3	4	5
CU4	I have the necessary knowledge to continue using Moodle	1	2	3	4	5
CU5	I plan to use Moodle in my future teaching practice	1	2	3	4	5
	Computer Self-efficacy					
CSE1	I can use Moodle even if there is no one to show me how to do it	1	2	3	4	5
CSE2	I can use Moodle even if I have never used it before	1	2	3	4	5
CSE3	I can use Moodle if I have only the online instructions for reference	1	2	3	4	5
CSE4	I can use Moodle if I have seen someone else use it before	1	2	3	4	5
CSE5	I can use Moodle if I am given time to familiarise myself with it	1	2	3	4	5
CSE6	I can use Moodle if someone shows me how to do it	1	2	3	4	5
CSE7	I can use Moodle if I had used a similar systems before	1	2	3	4	5
CSE8	I can use Moodle if I have the built-in help facility for assistance	1	2	3	4	5
CSE9	I believe I have the ability to install the software to access Moodle	1	2	3	4	5
	Subjective Norm					
SN1	My friends think that I should use Moodle for my studies	1	2	3	4	5
SN2	My lecturers think that I should use Moodle for my studies	1	2	3	4	5
SN3	My colleagues at the university think that I should use Moodle	1	2	3	4	5
SN4	Important people to me think that I should use Moodle	1	2	3	4	5
SN5	My peers think that I should use Moodle for my studies	1	2	3	4	5
	Perceived Attitude					
ATT1	Using Moodle is a good idea	1	2	3	4	5
ATT2	I feel that using Moodle is pleasant	1	2	3	4	5
ATT3	I feel that it is desirable to use Moodle	1	2	3	4	5
ATT4	In my view using Moodle is a wise idea	1	2	3	4	5

Appendix 2: Construction of Questionnaire

Construct	Code	Indicator	Source
Perceived confidence	CON1	I am confident when using Moodle in class	Gonzales (2018)
	CON2	I am confident when using Moodle tools for educational purposes	
	CON3	I am confident when using Moodle as an educational tool	
	CON4	I am confident when accessing a course on Moodle	
	CON5	I am confident in using the messaging tool on Moodle	
	CON6	I am confident when uploading files for assessment on Moodle	
	CON7	I am confident when downloading files from Moodle	
	CON8	I am confident when using the chat tool in Moodle	
	CON9	I am confident when using the forum tool on Moodle	
Perceived Preparedness	PPD1	I can login to Moodle without assistance	Gonzales (2018)
	PPD2	I am able to navigate through Moodle tools without assistance	
	PPD3	I can update my Moodle profile settings without assistance	
	PPD4	I am able to download my course grades from Moodle	
	PPD5	I am able to upload files for marking on Moodle	
	PPD6	I am able to participate in discussions on Moodle forums	
	PPD7	I am able to access feedback from lecturers on Moodle	
	PPD8	I am able to respond to quizzes on Moodle	
	PPD9	I am able to download materials from folders on Moodle	
Perceived usefulness	PU1	I find Moodle useful for learning	Sánchez-Prieto (2019)
	PU2	Using Moodle makes my learning more effective	Binyamin (2018)
	PU3	Using Moodle helps me to improve my learning performance	Roca & Gagné (2008)
	PU4	Using Moodle enables me to accomplish tasks more quickly	
	PU5	Using Moodle enables me to score better grades in my coursework	
Perceived ease of use	PEOU1	Learning to use Moodle was easy for me	Sánchez-Prieto (2019)
	PEOU2	I found Moodle easy to use	Binyamin (2018
	PEOU3	It was easy to become skilful at using Moodle	Roca & Gagné (2008)
	PEOU4	My interaction with Moodle is clear and understandable	
	PEOU5	I find it easy to navigate through most of the Moodle tools	
Perceived Resources	PR1	I have the resources I need to use Moodle	Sivo et al (2018)
	PR2	I have access to the resources I need to use Moodle	
	PR3	I am able to use Moodle any time I want	
	PR4	There are no barriers to my using Moodle in computer labs	
	PR5	I have Moodle installed on my laptop and smartphone	
Behavioural Intention to Use	BI1	I intend to increase my use of Moodle in different learning activities	Cheng et al. (2006)
	BI2	I see myself using Moodle for handling my university related work	Jahangir & Begum (2008)
	BI3	I intend to use Moodle for my future studies	
	BI4	I would recommend using Moodle to others	Sánchez-Prieto (2019)
Actual Use	AU1	I login to Moodle several times per week	
	AU2	On average I spend more than an hour each time I login to Moodle	
	AU3	I use Moodle to access my notes	
	AU4	I use Moodle for assessments	
Continued Use	CU1	I depend on Moodle for most of my academic work	Clare (2019)
	CU2	I would like to use Moodle in all my modules	
	CU3	I will continue using Moodle until I finish my studies	
	CU4	I have the necessary knowledge to continue using Moodle	
	CU5	I plan to use Moodle in my future teaching practice	
Computer Self-efficacy	CSE1	I can use Moodle even if there is no one to show me how to do it	Lee et al. (2003)
	CSE2	I can use Moodle even if I have never used it before	Rabaai (2016)
	CSE3	I can use Moodle if I have only the online instructions for reference	Samos (2019)
	CSE4	I can use Moodle if I have seen someone else use it before	Sánchez-Prieto (2019)
	CSE5	I can use Moodle if I am given time to familiarise myself with it	Binyamin (2018)
	CSE6	I can use Moodle if someone shows me how to do it	
	CSE7	I can use Moodle if I had used a similar systems before	
	CSE8	I can use Moodle if I have the built-in help facility for assistance	
	CSE9	I believe I have the ability to install the software to access Moodle	
Subjective Norm	SN1	My friends think that I should use Moodle for my studies	Sánchez-Prieto (2019)
	SN2	My lecturers think that I should use Moodle for my studies	Binyamin (2018)
	SN3	My colleagues at the university think that I should use Moodle	
	SN4	Important people to me think that I should use Moodle	
	SN5	My peers think that I should use Moodle for my studies	
Perceived Attitude	ATT1	Using Moodle is a good idea	Lee et al. (2003)
	ATT2	I feel that using Moodle is pleasant	Rabaai (2016)
	ATT3	I feel that it is desirable to use Moodle	
	ATT4	In my view using Moodle is a wise idea	

Appendix 3: Descriptive Statistics of the Instrument (N = 252)

All the constructs of the model in this study were measured using a five-point Likert scale, with 1 - strongly agree, 2 - agree, 3 - undecided, 4 - disagree, and 5 - strongly disagree. A low indicator mean implies that the majority of respondents agree with the indicator on the questionnaire. A high indicator mean implies that the majority of respondents were not agreeing with the indicator on the questionnaire.

Code	Construct	N	Mean	Standard Deviation
	Confidence			
CON1	I am confident when using Moodle in class	252	1.86	1.050
CON2	I am confident when using Moodle tools for educational purposes	252	2.01	1.02
CON3	I am confident when using Moodle as an educational tool	252	2.34	1.189
CON4	I am confident when accessing a course on Moodle	252	2.25	1.128
CON5	I am confident in using the messaging tool on Moodle	252	2.25	1.100
CON6	I am confident when uploading files for assessment on Moodle	252	2.42	1.203
CON7	I am confident when downloading files from Moodle	252	2.12	1.099
CON8	I am confident when using the chat tool in Moodle	252	2.50	1.183
CON9	I am confident when using the forum tool on Moodle	252	2.08	1.079
	Preparedness			
PPD1	I am confident when using Moodle in class	252	2.42	1.262
PPD2	I am confident when using Moodle tools for educational purposes	252	2.31	1.059
PPD3	I am confident when using Moodle as an educational tool	252	2.52	1.122
PPD4	I am confident when accessing a course on Moodle	252	2.62	1.213
PPD5	I am confident in using the messaging tool on Moodle	252	2.55	1.119
PPD6	I am confident when uploading files for assessment on Moodle	252	2.42	1.089
PPD7	I am confident when downloading files from Moodle	252	2.48	1.148
PPD8	I am confident when using the chat tool in Moodle	252	2.30	1.054
PPD9	I am confident when using the forum tool on Moodle	252	2.45	1.147
	Perceived usefulness			
PU1	I find Moodle useful for learning	252	2.43	1.132
PU2	Using Moodle makes my learning more effective	252	2.59	1.145
PU3	Using Moodle helps me to improve my learning performance	252	2.52	1.196
PU4	Using Moodle enables me to accomplish tasks more quickly	252	2.89	1.159
PU5	Using Moodle enables me to score better grades in my coursework	252	2.67	1.311
	Perceived ease of use			
PEOU1	Learning to use Moodle was easy for me	252	2.46	1.137
PEOU2	I found Moodle easy to use	252	2.38	1.153
PEOU3	It was easy to become skilful at using Moodle	252	2.44	1.126
PEOU4	My interaction with Moodle is clear and understandable	252	2.32	1.084
PEOU5	I find it easy to navigate through most of the Moodle tools	252	2.05	1.205
	Perceived Resources			
PR1	I have the resources I need to use Moodle	252	2.27	1.184
PR2	I have access to the resources I need to use Moodle	252	2.46	1.291
PR3	I am able to use Moodle any time I want	252	2.4	1.154

PR4	There are no barriers to my using Moodle in computer labs	252	2.24	1.119
PR5	I have Moodle installed on my laptop and smartphone	252	2.46	1.177
	Behavioural Intention			
BI1	I intend to increase my use of Moodle in different learning activities	252	2.13	1.089
BI2	I see myself using Moodle for handling my university related work	252	2.50	1.145
BI3	I intend to use Moodle for my future studies	252	2.15	1.125
BI4	I would recommend using Moodle to others	252	2.48	1.232
	Continued use of Moodle			
CU1	I depend on Moodle for most of my academic work	252	2.48	1.12
CU2	I would like to use Moodle in all my modules	252	2.50	1.145
CU3	I will continue using Moodle until I finish my studies	252	2.36	1.056
CU4	I have the necessary knowledge to continue using Moodle	252	2.44	1.174
CU5	I plan to use Moodle in my future teaching practice	252	2.51	1.088
	Actual use of Moodle			
AU1	I login to Moodle several times per week	252	2.35	1.051
AU2	On average I spend more than an hour each time I login to Moodle	252	2.34	1.151
AU3	I use Moodle to access my notes	252	2.56	1.133
AU4	I use Moodle for assessments	252	2.43	1.082
	Computer Self-efficacy			
CSE1	I can use Moodle even if there is no one to show me how to do it	252	2.47	1.134
CSE2	I can use Moodle even if I have never used it before	252	2.42	1.187
CSE3	I can use Moodle if I have only the online instructions for reference	252	2.84	1.207
CSE4	I can use Moodle if I have seen someone else use it before	252	2.52	1.352
CSE5	I can use Moodle if I am given time to familiarise myself with it	252	2.36	1.154
CSE6	I can use Moodle if someone shows me how to do it	252	2.38	1.203
CSE7	I can use Moodle if I had used a similar systems before	252	2.42	1.146
CSE8	I can use Moodle if I have the built-in help facility for assistance	252	2.17	1.026
CSE9	I believe I have the ability to install the software to access Moodle	252	1.90	1.082
	Subjective Norm			
SN1	My friends think that I should use Moodle for my studies	252	2.03	1.011
SN2	My lecturers think that I should use Moodle for my studies	252	2.21	1.196
SN3	My colleagues at the university think that I should use Moodle	252	2.12	1.118
SN4	Important people to me think that I should use Moodle	252	2.2	1.134
SN5	My peers think that I should use Moodle for my studies	252	2.25	1.194
	Perceived Attitude			
ATT1	Using Moodle is a good idea	252	2.08	1.107
ATT2	I feel that using Moodle is pleasant	252	2.52	1.216
ATT3	I feel that it is desirable to use Moodle	252	2.02	1.086
ATT4	In my view using Moodle is a wise idea	252	2.42	1.226

Appendix 4: Normality Tests

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
CON1	.291	252	.000	.739	252	.000
(CON2	.310	252	.000	.791	252	.000
CON3	.256	252	.000	.864	252	.000
CON4	.246	252	.000	.861	252	.000
CON5	.270	252	.000	.858	252	.000
CON6	.247	252	.000	.874	252	.000
CON7	.314	252	.000	.800	252	.000
CON8	.256	252	.000	.879	252	.000
CON9	.244	252	.000	.838	252	.000
PPD1	.250	252	.000	.871	252	.000
PPD2	.280	252	.000	.863	252	.000
PPD3	.243	252	.000	.880	252	.000
PPD4	.219	252	.000	.897	252	.000
PPD5	.221	252	.000	.900	252	.000
PPD6	.230	252	.000	.891	252	.000
PPD7	.249	252	.000	.885	252	.000
PPD8	.282	252	.000	.862	252	.000
PPD9	.259	252	.000	.870	252	.000
PU1	.208	252	.000	.890	252	.000
PU2	.236	252	.000	.896	252	.000
PU3	.217	252	.000	.892	252	.000
PU4	.219	252	.000	.894	252	.000
PU5	.199	252	.000	.892	252	.000
PEOU1	.238	252	.000	.889	252	.000
PEOU2	.246	252	.000	.877	252	.000
PEOU3	.258	252	.000	.880	252	.000
PEOU4	.255	252	.000	.874	252	.000
PEOU5	.271	252	.000	.790	252	.000
PR1	.297	252	.000	.833	252	.000
PR2	.242	252	.000	.867	252	.000
PR3	.262	252	.000	.851	252	.000
PR4	.272	252	.000	.852	252	.000
PR5	.244	252	.000	.879	252	.000

BI1	.291	252	.000	.822	252	.000
BI2	.273	252	.000	.875	252	.000
BI3	.262	252	.000	.838	252	.000
BI4	.256	252	.000	.874	252	.000
AU1	.293	252	.000	.858	252	.000
AU2	.250	252	.000	.869	252	.000
AU3	.237	252	.000	.895	252	.000
AU4	.255	252	.000	.884	252	.000
CU1	.243	252	.000	.888	252	.000
CU2	.234	252	.000	.892	252	.000
CU3	.296	252	.000	.856	252	.000
CU4	.259	252	.000	.875	252	.000
CU5	.219	252	.000	.899	252	.000
CSE1	.253	252	.000	.884	252	.000
CSE2	.238	252	.000	.879	252	.000
CSE3	.233	252	.000	.887	252	.000
CSE4	.227	252	.000	.871	252	.000
CSE5	.258	252	.000	.871	252	.000
CSE6	.235	252	.000	.874	252	.000
CSE7	.258	252	.000	.876	252	.000
CSE8	.258	252	.000	.859	252	.000
CSE9	.298	252	.000	.750	252	.000
SN1	.301	252	.000	.806	252	.000
SN2	.271	252	.000	.833	252	.000
SN3	.279	252	.000	.822	252	.000
SN4	.277	252	.000	.841	252	.000
SN5	.251	252	.000	.851	252	.000
ATT1	.309	252	.000	.792	252	.000
ATT2	.254	252	.000	.880	252	.000
ATT3	.272	252	.000	.807	252	.000
ATT4	.258	252	.000	.868	252	.000

a. Lilliefors Significance Correction

Appendix 5: Turnitin Similarities Report

Pre-service Teachers' Acceptance, Confidence, and Preparedness to use Learning Management Systems

ORIGINALITY REPORT

13%	12%	7%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	napier-surface.worktribe.com Internet Source	2%
2	uobrep.openrepository.com Internet Source	2%
3	online-journals.org Internet Source	1%
4	d22bbllmj4tvv8.cloudfront.net Internet Source	1%
5	unbscholar.lib.unb.ca Internet Source	1%
6	etd.fcla.edu Internet Source	1%
7	docplayer.net Internet Source	1%
8	aut.researchgateway.ac.nz Internet Source	1%
9	Admire Chibisa, Mswazi Gladson Tshabalala, Mncedisi Christian Maphalala. "Pre-Service	1%

Appendix 6: Language Editor's Certificate

Helen Bond
IMPELA EDITING SERVICES
impelaediting@gmail.com
079 395 5873

3 January 2022

CERTIFICATE

Admire Chibisa

chibisaA@unizulu.ac.za

Dear Admire

Thank you for using my editing services to proofread your PhD dissertation entitled, "Pre-service Teachers' Acceptance, Confidence, and Preparedness to Use Learning Management Systems".

I have proofread for errors of grammar, punctuation, spelling, syntax and typing mistakes. I have formatted your work and checked the references (this means checking the formatting). I believe your work to be error free.

PLEASE NOTE: Impela Editing accepts no fault if an author makes changes to a document after a certificate has been issued.

I wish you the very best with your submission and your career.

Kind regards

Helen Bond (Bachelor of Arts, HDE)

Appendix 7: Ethical Clearance Certificate

UNIVERSITY OF ZULULAND
RESEARCH ETHICS COMMITTEE
(Reg No: UZREC 171110-030)

RESEARCH & INNOVATION
Website: http://www.unizulu.ac.za
Private Bag X1001
KwaDlangezwa 3886
Tel: 035 902 6273
Email: VRjoint@unizulu.ac.za

ETHICAL CLEARANCE CERTIFICATE

Certificate Number	UZREC 171110-030 PGD 2017/189							
Project Title	Pre-service Teachers' Acceptance, Confidence and Preparedness to use Learning Management Systems							
Principal Researcher/ Investigator	A Chibika							
Supervisor and Co-supervisor	Prof D.C Sibaya							
Department	Mathematics, Science and Technology Education							
Faculty	Education							
Type of Risk	Medium Risk – Data collection from people							
Nature of Project	Honours/4th Year		Master's		Doctoral	x	Departmental	

The University of Zululand's Research Ethics Committee (UZREC) hereby gives ethical approval in respect of the undertakings contained in the above mentioned project. The Researcher may therefore commence with data collection as from the date of this Certificate, using the certificate number indicated above.

Special conditions:

(1) This certificate is valid for 1 year from the date of issue.
(2) Principal researcher must provide an annual report to the UZREC in the prescribed format (due date-06 March 2022)
(3) Principal researcher must submit a report at the end of project in respect of ethical compliance.
(4) The UZREC must be informed immediately of any material change in the conditions or undertakings mentioned in the documents that were presented to the meeting.

The UZREC wishes the researcher well in conducting research.

Professor Mathuppe R. Kgaphola
University Research Ethics Committee
Deputy Vice-Chancellor: Research & Innovation

05 March 2021

CHAIRPERSON
UNIVERSITY OF ZULULAND RESEARCH
ETHICS COMMITTEE (UZREC)
REG NO: UZREC 171110-30

05 03

RESEARCH & INNOVATION OFFICE

Appendix 8: Consent Letter

ANNEXURE A: PARTICIPANT INFORMED CONSENT DECLARATION

INFORMED CONSENT DECLARATION

(Participant)

Project Title: **Pre-service Teachers' Acceptance, Confidence, and Preparedness to use Learning Management Systems**

Admire Chibisa from the Department of **Mathematics, Science and Technology Education**, University of Zululand has requested my permission to participate in the above-mentioned research project.

The nature and the purpose of the research project, and of this informed consent declaration have been explained to me in a language that I understand.

I am aware that:

1. The purpose of the research project is to **examine pre-service teachers' acceptance, confidence and preparedness to use learning management systems in the context of a South African Rural University**

2. The University of Zululand has given ethical clearance to this research project and I have seen/may request to see the clearance certificate.

3. By participating in this research project I will be contributing towards ***understanding the factors that affect pre-service teachers' acceptance of the Moodle Learning Management System which will go a long way to assist students themselves, their lecturers and administrators to come up with sound solutions to the problem that inhibit online learning at rural institutions***

4. I will participate in the project by ***responding to the questionnaire given me and return it to the researcher on time***

5. My participation is entirely voluntary and should I at any stage wish to withdraw from participating further, I may do so without any negative consequences.

6. I will not be compensated for participating in the research, but my out-of-pocket expenses will be reimbursed. (***there will not any form of compensation***)

7. There may be risks associated with my participation in the project. I am aware that

   a. the following risks are associated with my participation: (***there will be no risks associated with the participation***)
   b. the following steps have been taken to prevent the risks: **N/A**
   c. there is a **0%** chance of the risk materialising

8. The researcher intends publishing the research results in the form of ***a thesis, research papers, as well as seminars and workshops***. However, confidentiality and anonymity of records will be maintained and that my name and identity will not be revealed to anyone who has not been involved in the conduct of the research.

9. I will not receive feedback/will receive feedback in the form of ***access to the thesis, research papers, as well as seminars and workshops to be organised by the researcher*** regarding the results obtained during the study.

10. Any further questions that I might have concerning the research or my participation will be answered by ***the researcher***

11. By signing this informed consent declaration, I am not waiving any legal claims, rights or remedies.

12. A copy of this informed consent declaration will be given to me, and the original will be kept on record.

I, …….. have read the above information / confirm that the above information has been explained to me in a language that I understand and I am aware of this document's contents. I have asked all questions that I wished to ask and these have been answered to my satisfaction. I fully understand what is expected of me during the research.

I have not been pressurised in any way and I voluntarily agree to participate in the above-mentioned project.

…… ……

Participant's signature **Date**